TOSHIBA

SERVICE MANUAL

DIGITAL PLAIN PAPER COPIER

e-STUDIO550/650/810

(DP-5510/6510/8110)



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TOSHIBA TEC CORPORATION

GENERAL PRECAUTIONS REGARDING THE INSTALLATION AND SERVICE FOR THE COPIER e-STUDIO550/650/810

The installation and service should be done by a qualified service technician.

1. Transportation/Installation

- When transporting/installing the copier, move it by the casters while lifting the stoppers. The copier is quite heavy and weighs approximately 200 kg (441 lb), therefore pay full attention when handling it.
- Be sure to use a dedicated outlet with AC 115V or 120V/20A (220V, 230V, 240V/10A) or more for its power source.
- The copier must be grounded for safety.
  Never ground it to a gas pipe or a water pipe.
- Select a suitable place for installation.
  Avoid excessive heat, high humidity, dust, vibration and direct sunlight.
- Also provide proper ventilation as the copier emits a slight amount of ozone.
- To insure adequate working space for the copying operation, keep a minimum clearance of 80 cm (32”) on the left, 80 cm (32”) on the right and 10 cm (4”) in the rear.
- The socket-outlet shall be installed near the copier and shall be easily accessible.

2. Service of Machines

- Basically, be sure to turn the main switch off and unplug the power cord during service.
- Be sure not to touch high-temperature sections such as the exposure lamp, the fuser unit, the damp heater and their periphery.
- Be sure not to touch high-voltage sections such as the chargers, high-voltage transformer, exposure lamp control inverter, inverter for the LCD backlight and power supply unit. Especially, the board of these components should not be touched since the electirc charge may remain in the condensers, etc. on them even after the power is turned OFF.
- Be sure not to touch rotating/operating sections such as gears, belts, pulleys, fan, etc.
- Be careful when removing the covers since there might be the parts with very sharp edges underneath.
- When servicing the machines with the main switch turned on, be sure not to touch live sections and rotating/operating sections. Avoid exposure to laser radiation.
- Use suitable measuring instruments and tools.
- Avoid exposure to laser radiation during servicing.
  - Avoid direct exposure to the beam.
  - Do not insert tools, parts, etc. that are reflective into the path of the laser beam.
  - Remove all watches, rings, bracelets, etc. that are reflective.

3. Main Service Parts for Safety

- The breaker, door switch, fuse, thermostat, thermofuse, thermistor, etc. are particularly important for safety. Be sure to handle/install them properly. If these parts are shorted circuit and/or made their functions out, they may burn down, for instance, and may result in fatal accidents. Do not allow a short circuit to occur. Do not use the parts not recommended by Toshiba TEC Corporation.

4. Cautionary Labels

- During servicing, be sure to check the rating plate and the cautionary labels such as “Unplug the power cord during service”, “Hot area”, “Laser warning label” etc. to see if there is any dirt on their surface and whether they are properly stuck to the copier.

5. Disposition of Consumable Parts, Packing Materials, Used batteries and RAM-ICs

- Regarding the recovery and disposal of the copier, supplies, consumable parts, packing materials, used batteries and RAM-ICs including litium batteries, it is recommended to follow the relevant local regulations or rules.

6. When parts are disassembled, reassembly is basically the reverse of disassembly unless otherwise noted in this manual or other related documents. Be careful not to reassemble small parts such as screws, washers, pins, E-rings, star washers in the wrong places.

7. Basically, the machine should not be operated with any parts removed or disassembled.

8. Precautions Against Static Electricity

- The PC board must be stored in an anti-electrostatic bag and handled carefully using a wrist-band, because the ICs on it may become damaged due to static electricity.

Caution: Before using the wristband, pull out the power cord plug of the copier and make sure that there are no uninsulated charged objects in the vicinity.

Caution :	Dispose of used batteries and RAM-ICs including lithium batteries according to this manual.
Attention :	Se débarrasser de batteries et RAM-ICs usés y compris les batteries en lithium selon ce manuel.
Vorsicht :	Entsorgung des gebrauchten Batterien und RAM-ICs (inklusive der Lithium-Batterie) nach diesem Handbuch.

1. SPECIFICATIONS / ACCESSORIES / OPTIONS / SUPPLIES

1. 1. Specifications
1. 2. Accessories
1. 3. Options
1. 4. Supplies
1. 5. System List

1. SPECIFICATIONS / ACCESSORIES / OPTIONS / SUPPLIES

1. 1. Specifications

When the specification is different among e-STUDIO550, 650 and 810, the value for e-STUDIO650 is shown by [ ] and the value for e-STUDIO810 is shown by { }.

- Copy process ..... Indirect electrophotographic process (dry system)
- Type ..... Console type
- Original table ..... Fixed type (left rear corner used as a guide to place originals)
- Acceptable originals ..... Sheets, books and 3-dimensional objects

  The automatic document feeder only accepts paper (single-sided originals: 50~127g/m^2/13~34lb.Bond, double-sided originals: 50~104g/m^2/13~28lb.Bond) excluding carbon paper, pasted sheet and stapled sheet.

  Maximum size : A3/LD
- Copy speed

e-STUDIO550 (Copies/min.)

Paper size \ Paper supply		Cassette	Tandem LCF	Bypass feeding	
				Size specified	Size not specified
A4, LT, B5	Top side discharging	55	55	48	33
	Back side discharging	55	55	48	30
A4-R, B5-R,	Top side discharging	44	—	42	33
A5-R, LT-R, ST-R	Back side discharging	42	—	42	30
B4, LG	Top side discharging	39	—	37	33
	Back side discharging	35	—	35	30
A3, LD	Top side discharging	34	—	33	33
	Back side discharging	30	—	30	30

e-STUDIO650 (Copies/min.)

Paper size \ Paper supply		Cassette	Tandem LCF	Bypass feeding	
				Size specified	Size not specified
A4, LT, B5	Top side discharging	65	65	48	33
	Back side discharging	65	65	48	33
A4-R, B5-R,	Top side discharging	50	—	42	33
A5-R, LT-R, ST-R	Back side discharging	48	—	42	33
B4, LG	Top side discharging	43	—	37	33
	Back side discharging	40	—	37	33
A3, LD	Top side discharging	37	—	33	33
	Back side discharging	34	—	33	33

e-STUDIO810 (Copies/min.)

Paper size \ Paper supply		Cassette	Tandem LCF	Bypass feeding	
				Size specified	Size not specified
A4, LT, B5	Top side discharging	81	81	50	34
	Back side discharging	81	81	50	34
A4-R, B5-R,	Top side discharging	61	—	44	34
A5-R, LT-R, ST-R	Back side discharging	56	—	44	34
B4, LG	Top side discharging	52	—	39	34
	Back side discharging	45	—	39	34
A3, LD	Top side discharging	43	—	34	34
	Back side discharging	37	—	34	34

* "–" means "Not acceptable".
* Each copy speed described in the table of the previous page is available when doing a multiple copying of the manually placed single-sided originals, and in this mode, only the top side discharging is carried out.
* When using the automatic document feeder, each copy speed of 55 [65] {81} copies/min. is available only when the following conditions are met:
  - Original/Mode : Single-sided original, A4/LT size, 1 sheet/APS and automatic density are not selected.
  - Preset number of sheets: 55 [65] {81} or more.
  - Reproduction ratio : 100%

* System copy speed

Copy mode		sec.		
		e-STUDIO 550	e-STUDIO 650	e-STUDIO 810
Single-sided originals	1 set	18"86	16"81	15"96
↓	3 sets	40"17	35"99	30"52
Single-sided copies	5 sets	61"92	53"56	45"19
Single-sided originals	1 set	21"28	20"70	20"46
↓	3 sets	42"91	39"47	36"37
Double-sided copies	5 sets	64"89	57"70	49"48
Double-sided originals	1 set	35"32	35"21	34"36
↓	3 sets	78"61	71"70	63"89
Double-sided copies	5 sets	121"96	108"01	95"06
Double-sided originals	1 set	31"77	31"49	30"88
↓	3 sets	74"75	67"97	60"58
Single-sided copies	5 sets	117"88	104"64	90"02

* System copy speed, including scanning time, is available when 10 sheets of A4-sized original are set on RADF and one of the copy modes in the left table is selected.
* 1st cassette is selected and copying is at the sort mode.
* Finisher, hole-punch unit and inserter are installed.
* Measurement deviation is included since the system copy speed was measured by actual measurement.

• Copy paper

	Cassette	Duplex copy	LCF	Bypass copy	Remarks
Size	A3~A5R, LD~ST-R, 13"LG, 8.5"x8.5", 8K, 16K, 16K-R		A4, LT	A3~A5-R, LD~ST-R, 8.5"x8.5", 8K, 16K, 16K-R (Non-standard or user-specified sizes can be set.)	No guarantee for 8K, 16K, 16K-R at duplex copy
Weight	64~209g/m^2, 17~110lb. -index			64~209g/m^2 17lb~110lb -index	
Special paper	Tab paper (2nd casette only)	_		Tracing paper, labels, OHP film (thickness: 80µm or thicker), tab paper	Special types of paper should be recommanded by Toshiba.

• First copy time ..... 3.3 seconds or less (A4/LT, LCF, 100%, original placed manually)

• Warming-up time ..... Approx.160 seconds (e-STUDIO550/650/810, Temperature: 20°C)

Notes: 1. This is at the condition not entering the toner supply operation.

2. The auto job start is not operated.

• Multiple copying ..... Up to 9999 copies; set number entered with digital keys

• Reproduction ratio ..... Actual ratio: 100±0.5%

Zooming: 25~400% in increments of 1%

(25~200% when using the RADF)

• Resolution/Gradation ..... Read: 600 dpi

..... Write: Equivalent to 2400 dpi x 600 dpi

(primary scanning only : 4 division smoothing)

• Eliminated image width ..... Leading edge: 3.0±1.0 mm, Trailig edge: 2.0±1.0 mm, Side edges: 2.0±2.0 mm

• Paper feeding ..... Automatic feeding: Copier cassettes–2 cassettes (Paper stack height 55 mm, equivalent to 550 sheets; 64 to 80 g/m^2 (17 to 22 lb.Bond))

LCF (Paper stack height 137 mm: equivalent to 2500 sheets; 64 to 80 g/m^2, 17 to 22 lb.Bond)

Bypass feeding: (Paper stack height 11 mm : equivalent to 100 sheets; 64 to 80 g/m^2, 17 to 22 lb.Bond)

• Capacity of originals in the automatic document feeder

..... A3~A5-R, LD~ST-R : 100 sheets

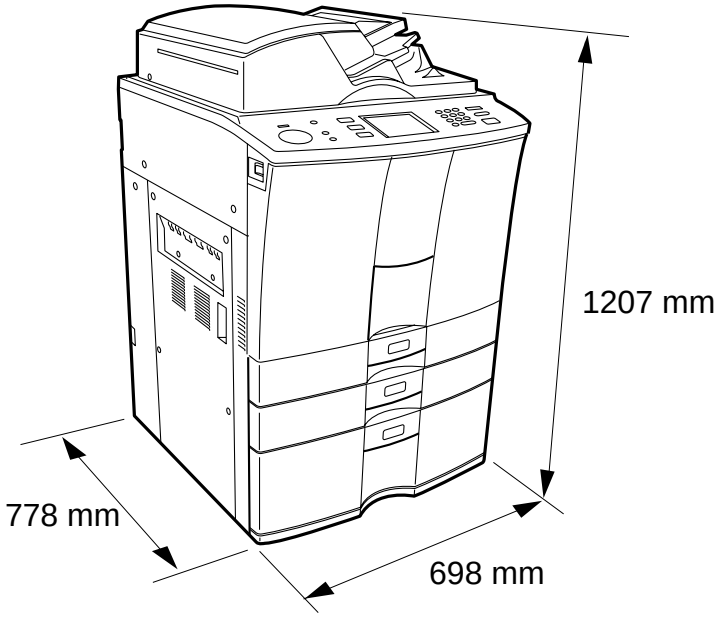
• Automatic duplexer ..... Stackless, Switchback type

• Toner supplying ..... Automatic toner density detection/supply

Toner cartridge replacing method

(There is a recycle toner supplying system.)

• Density control ..... Automatic density mode and manual density mode selectable in 11 steps
• Weight ..... Approx. 200kg, 441lb
• Power requirements ..... AC 115V/15A, AC 220 – 240V/10A
• Power consumption ..... 2.0 kW or less (115V series, 200V series)
    * The electric power is supplied to the finisher and external LCF (optional) through the copier.
• Total counter ..... Electronic counter
• Dimensions of the copier ... See the figure below. (W698x D778 x H1207 mm)



1. 2. Accessories

Unpacking/setup instruction	1 pc.
Operator's Manual	1 pc. (not available for MJD)
PM sticker	1 pc. (for MJD)
Setup report	1 set. (for NAD and MJD)
Customer satisfaction card	1 pc. (for MJD)
Operator's Manual pocket	1 pc.
Power cable	1 pc. (for ASD, AUD and MJD)
Warranty sheet	1 pc. (for NAD)
Drum	1 pc.
Drum cover	1 pc.
Original feeding tray	1 pc.
Tab paper end guide	1 pc.

* Machine version

  NAD: North America

  MJD: Europe

  AUD: Australia

  ASD: Asia

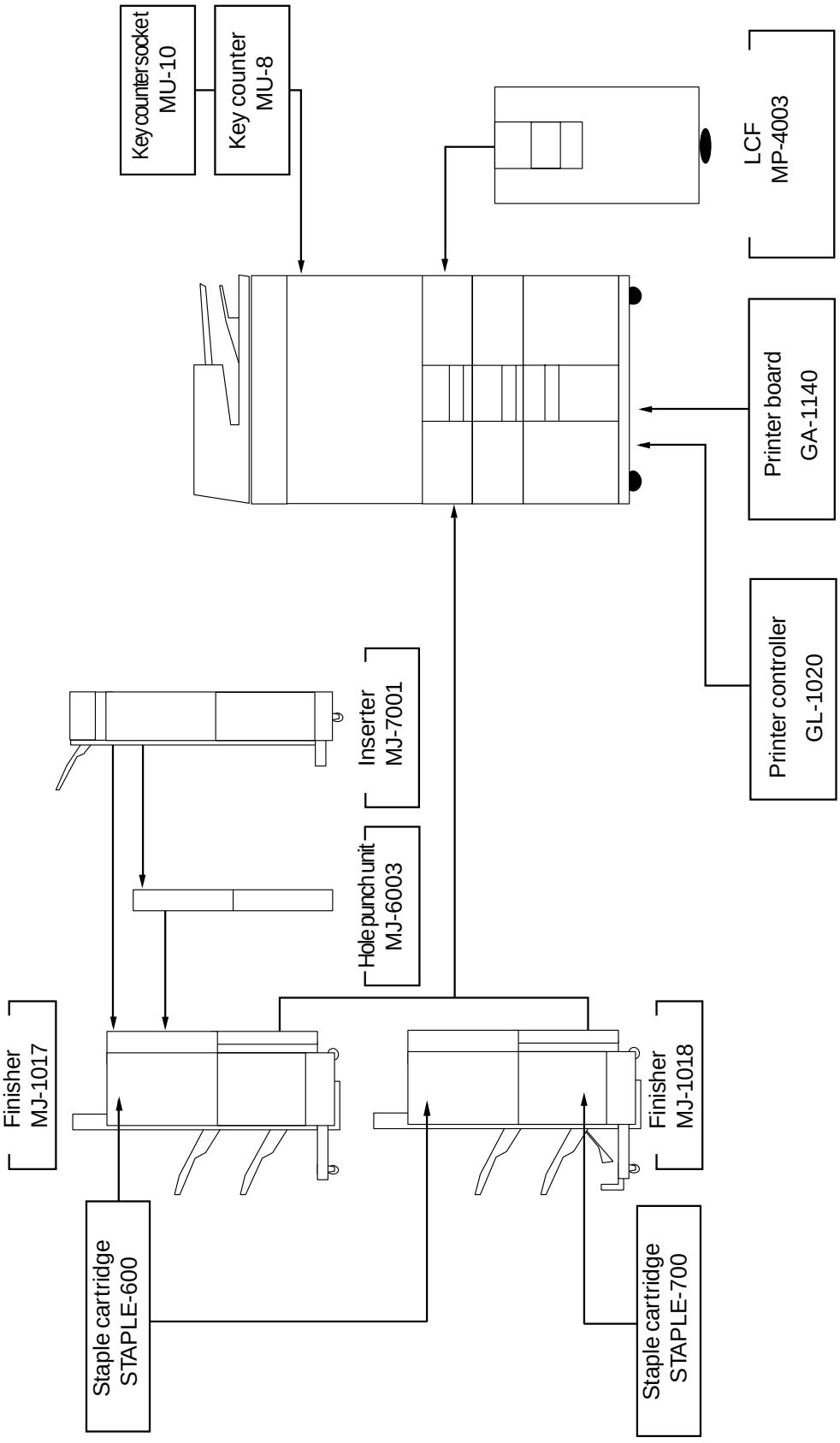
1. 3. Options

Finisher	MJ-1017, MJ-1018
Hole punch unit	MJ-6003N/E/F/S
Inserter	MJ-7001
Staple cartridge	STAPLE-600/STAPLE-700 (for saddle stitcher)
External large capacity feeder	MP-4003A/L
Key copy counter/Key copy counter socket	MU-8/MU-10
Damp heater kit	MF-6510U/E
Printer controller	GL-1020
Printer board	GA-1140

1. 4. Supplies

Drum	OD-6510
Developer material	D-6510
Toner	PS-ZT6510/PS-ZT6510/PS-ZT-6510D
Toner bag	PS-TB6510/PS-TB6510E

1. 5. System List



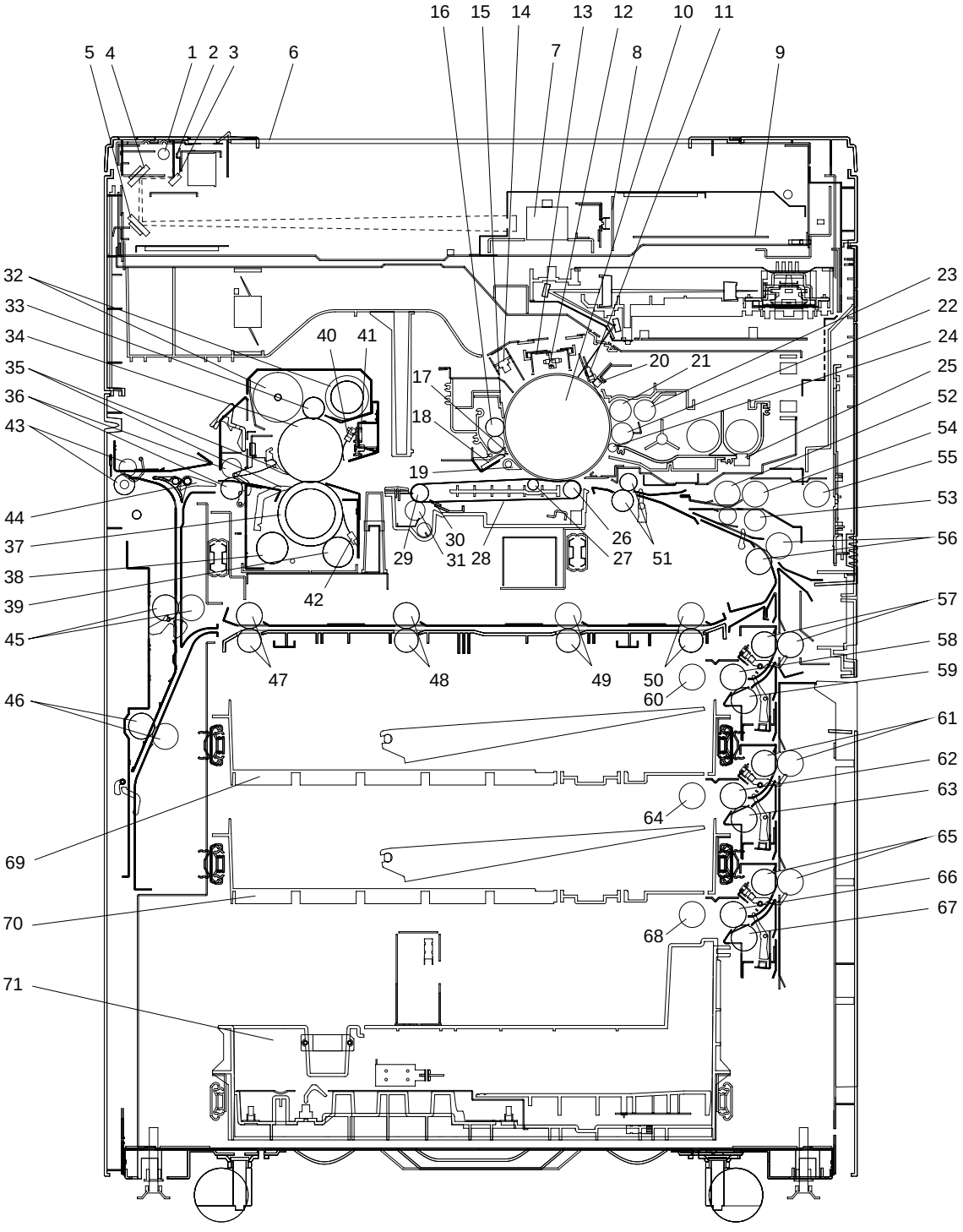
2. OUTLINE OF THE MACHINE

2. 1. Sectional View
2. 2. Electric Parts Layout
2. 3. Symbols and Functions of Various Components
2. 4. Symbols and Functions of RADF Various Components
2. 5. System Block Layout
2. 6. Disassembly and Replacement of Covers and PC Boards
2. 6. 1. Covers
2. 6. 2. PC boards

2. OUTLINE OF THE MACHINE

2. 1. Sectional View

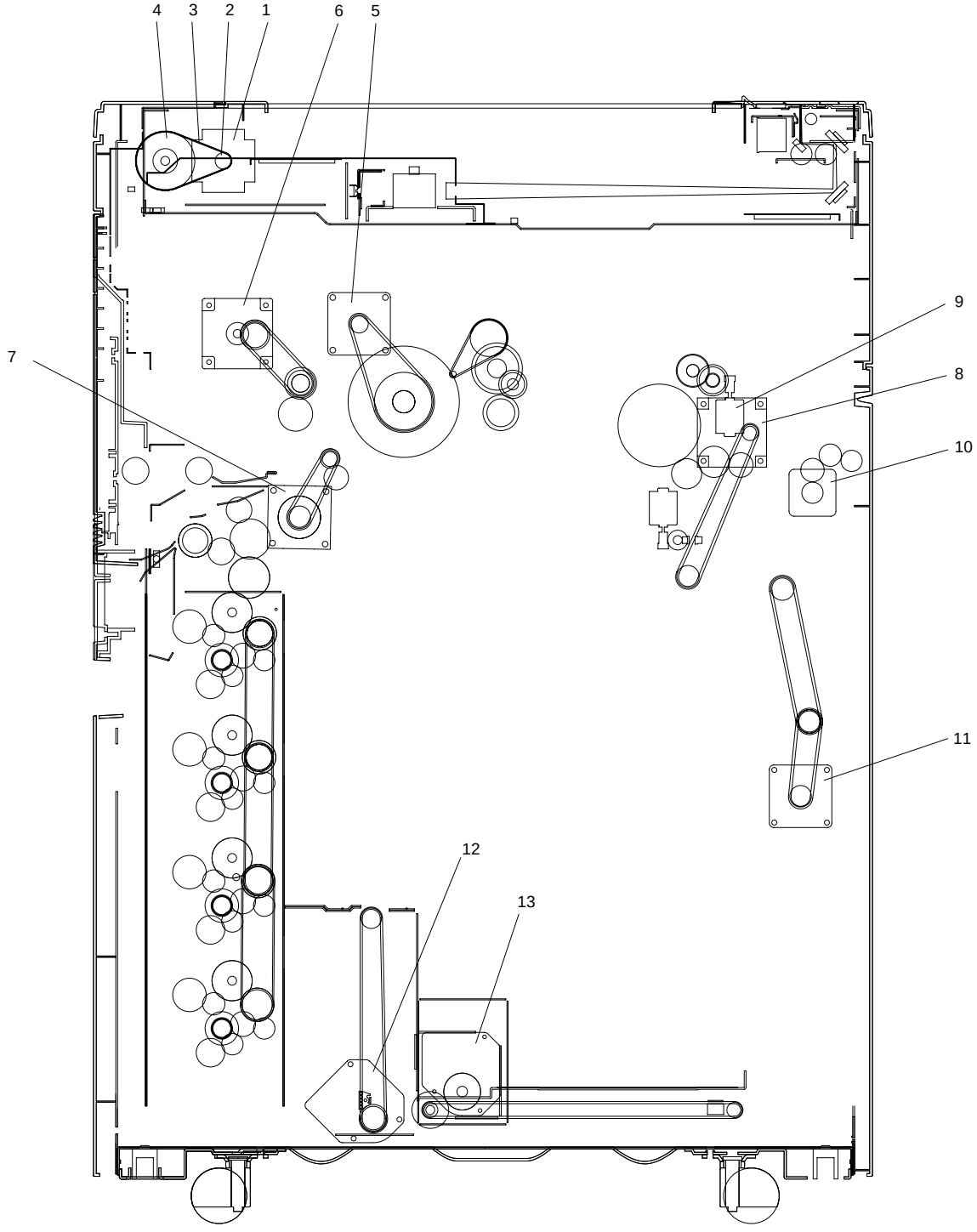
[A] Front side view



1	Exposure lamp
2	Reflector
3	Mirror 1
4	Mirror 2
5	Mirror 3
6	Original glass
7	Lens
8	CCD driving PC board
9	Scanner control PC board
10	Drum
11	Drum thermistor
12	Charger wire cleaner
13	Main charger
14	Discharge LED
15	Drum cleaning blade
16	Drum cleaning brush
17	Drum recoverly blade
18	Image quality sensor
19	Drum separation finger
21	Upper developer sleeve (Magnetic roller)
22	Lower developer sleeve (Magnetic roller)
23	Doctor blade
24	Scattered toner recovery roller
25	Auto-toner sensor
26	Transfer belt driven roller
27	Transfer belt power supply roller
28	Transfer belt
29	Transfer belt drive roller
30	Transfer belt cleaning blade
31	Transfer belt cleaning brush
32	Cleaning web
33	Cleaning web pushing roller
34	Fuser roller
35	Separation finger
36	Fuser exit roller
37	Pressure roller
38	Cleaning roller (metal)
39	Cleaning roller (felt)
40	Fuser roller thermistor

41	Thermostat
42	Pressure roller thermistor
43	Exit roller
44	Reverse/exit switching gate
45	Reverse path roller 1
46	Reverse path roller 2
47	Transfer roller 1
48	Transfer roller 2
49	Transfer roller 3
50	Transfer roller 4
51	Registration roller
52	Bypass transfer roller
53	Bypass separation roller
54	Bypass feed roller
55	Bypass pickup roller
56	Intermiditate transfer roller
57	1st cassette transfer roller
58	1st cassette feed roller
59	1st cassette separation roller
60	1st cassette pickup roller
61	2nd cassette transfer roller
62	2nd cassette feed roller
63	2nd cassette separation roller
64	2nd cassette pickup roller
65	Tandem LCF transfer roller
66	Tandem LCF feed roller
67	Tandem LCF separation roller
68	Tandem LCF cassette pickup roller
69	1st cassette
70	2nd cassette
71	Tandem LCF tray

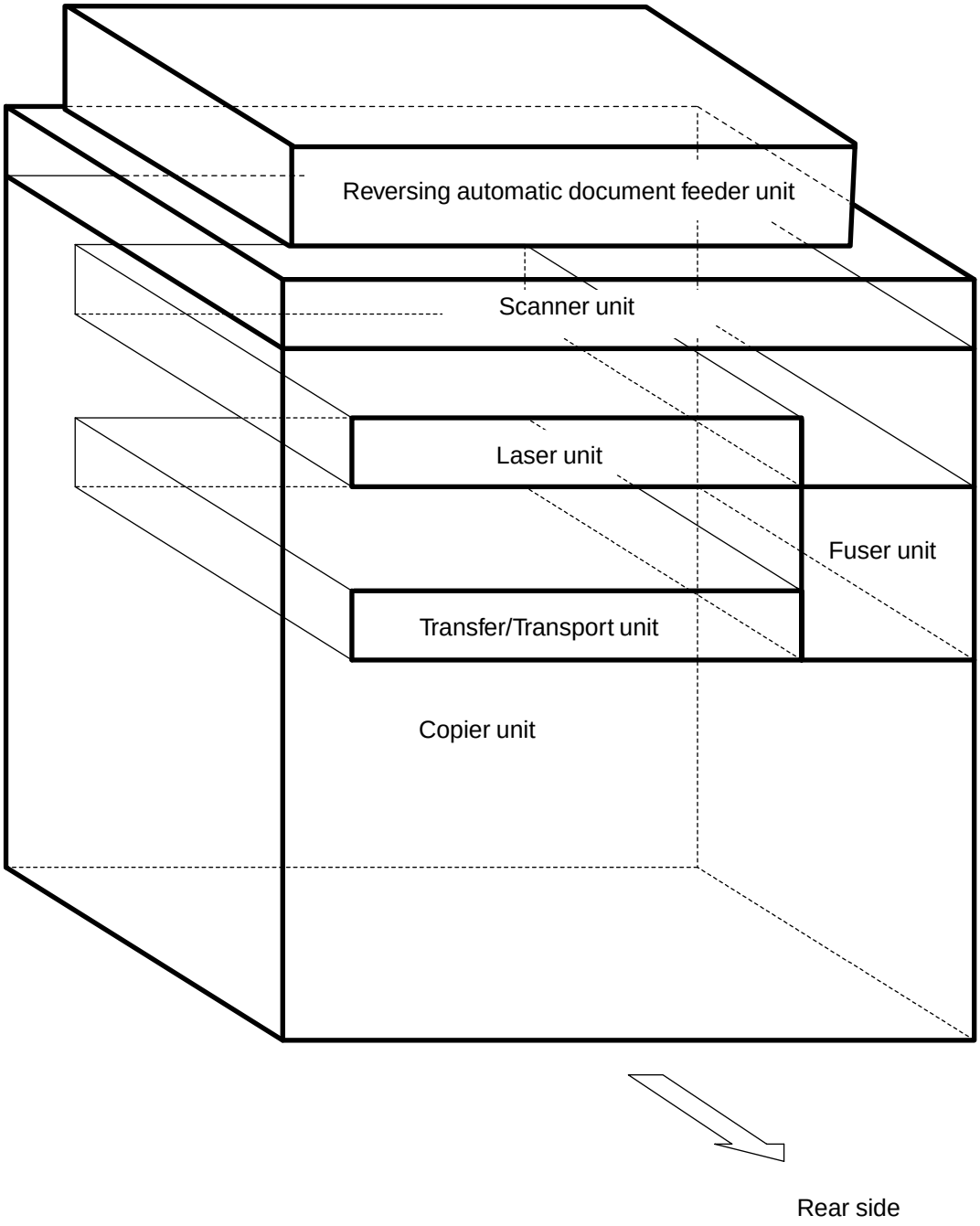
[B] Rear side view (Drive system)



1	Scanner motor
2	Drive pulley
3	Drive belt
4	Driven pulley
5	Drum motor
6	Developer unit motor
7	Registration motor
8	Fuser motor
9	Web motor
10	Exit motor
11	Reverse motor
12	LCF tray-up motor
13	LCF end fence motor

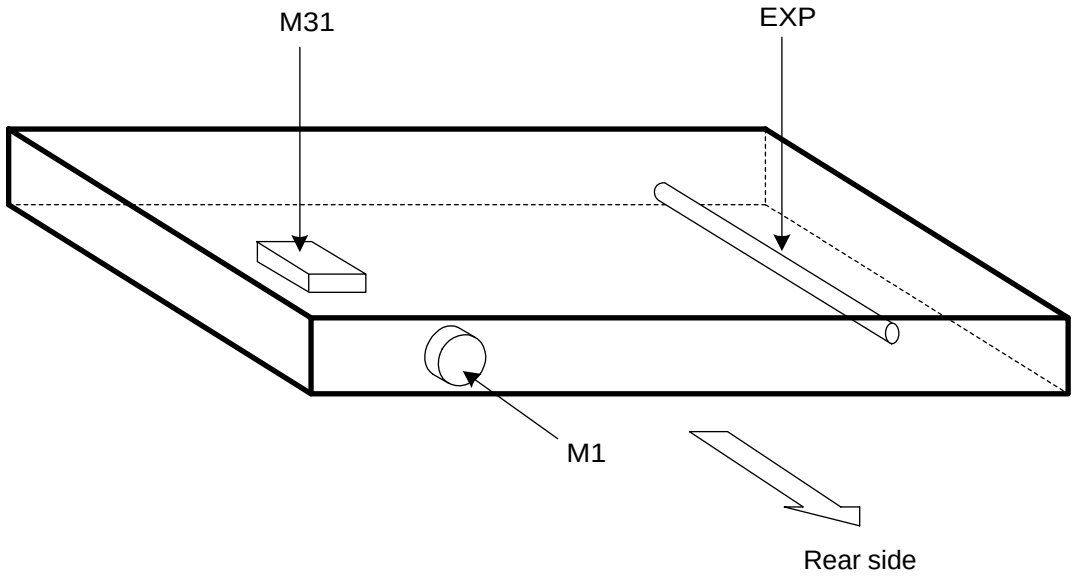
2. 2. Electric Parts Layout

[A] Unit construction



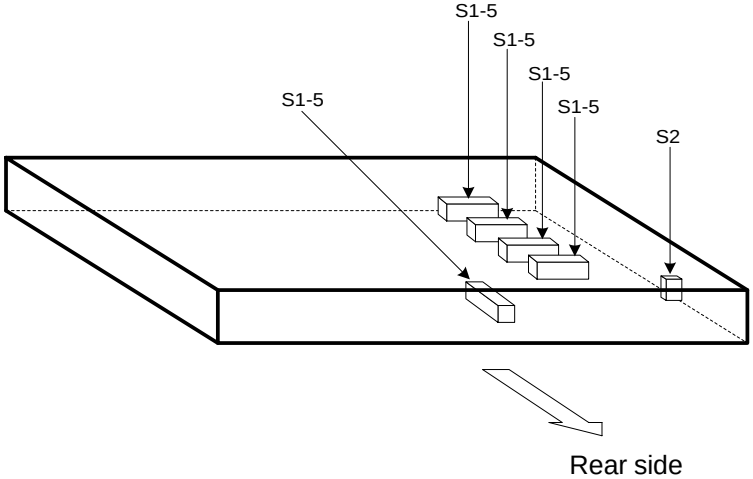
[B] Scanner unit

(B-1) Motor/Exposure lamp

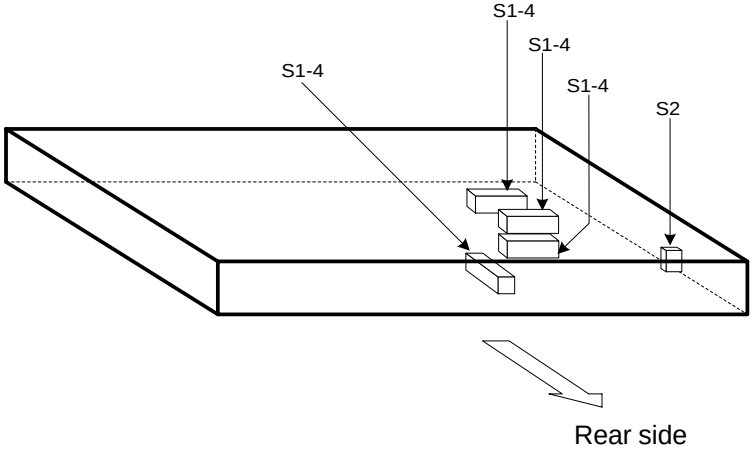


(B-2) Sensor/Switch

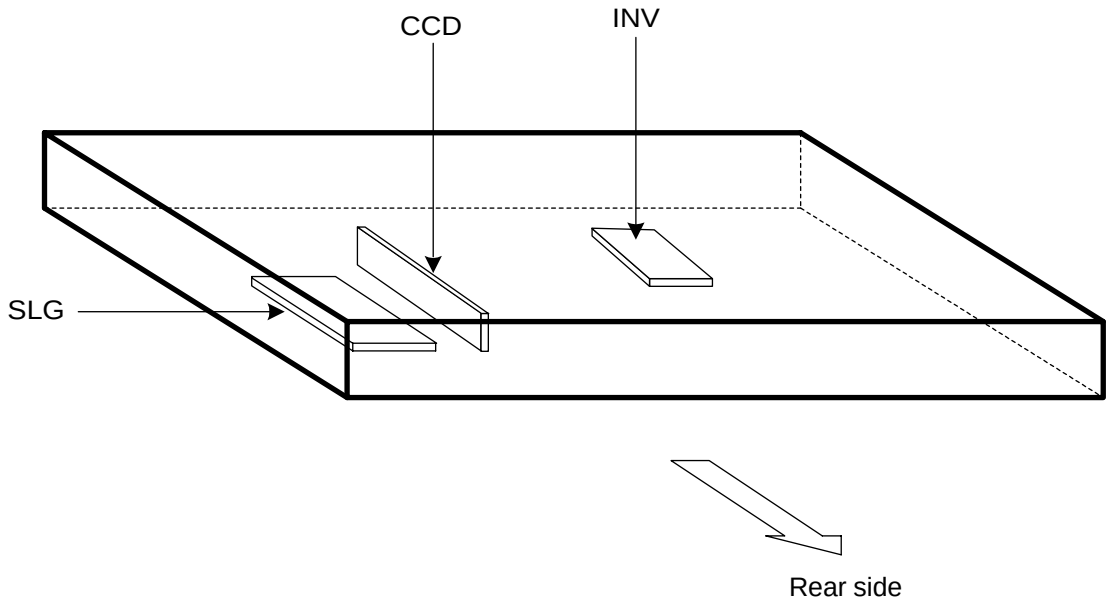
A4 series



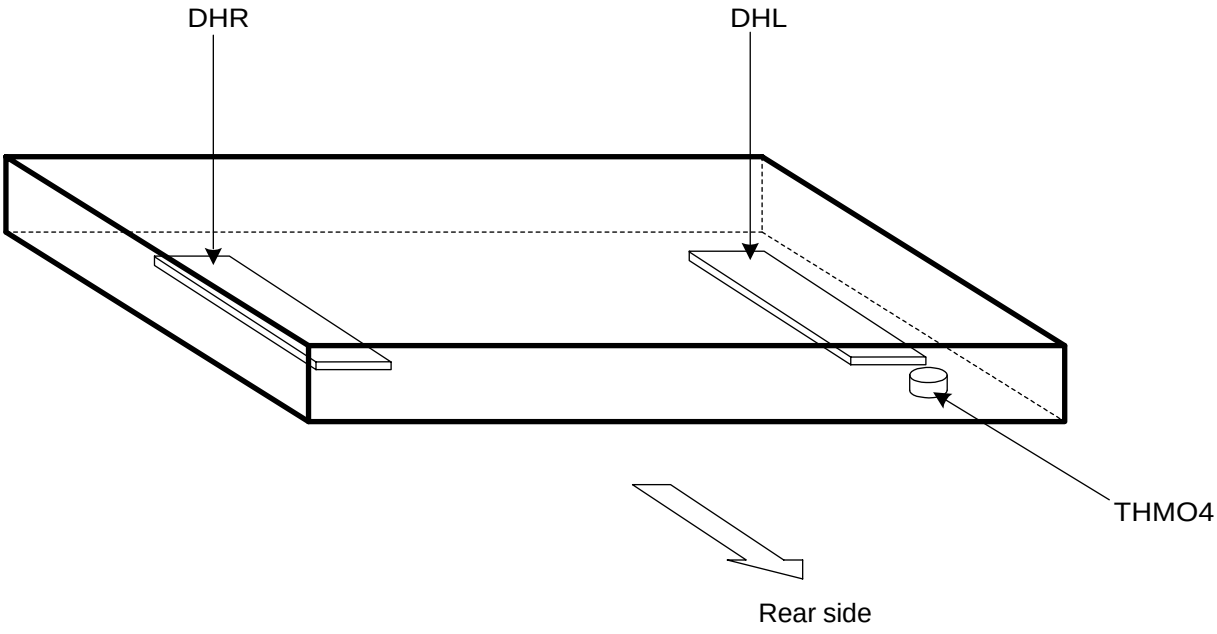
LT series



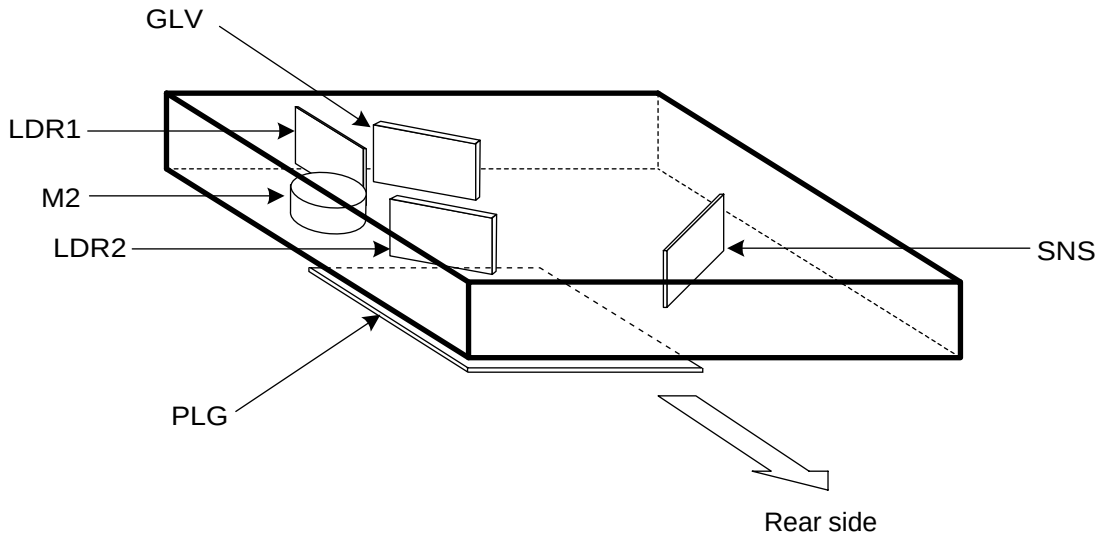
(B-3) PC board



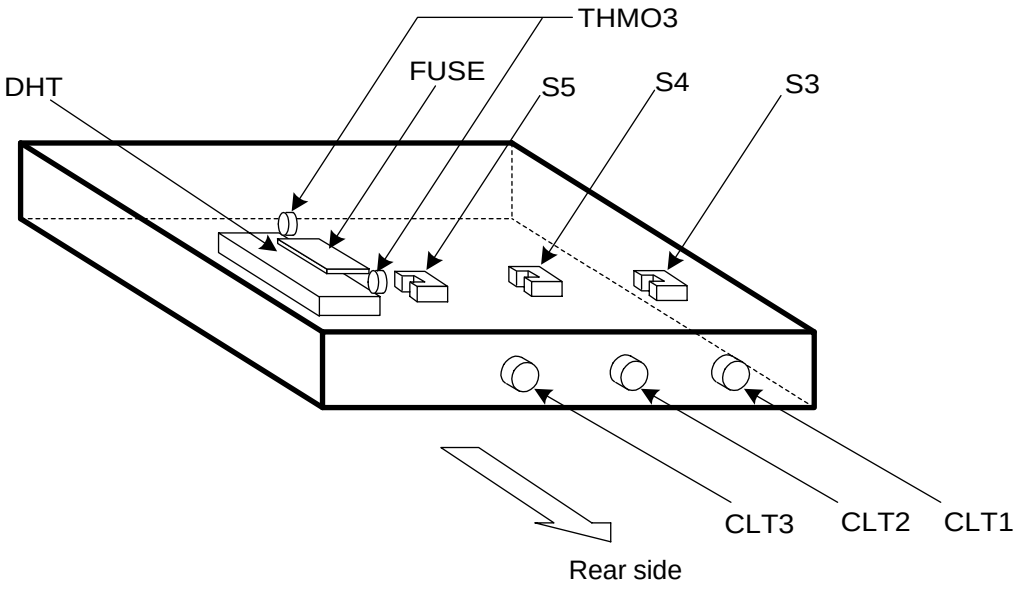
(B-4) Other parts



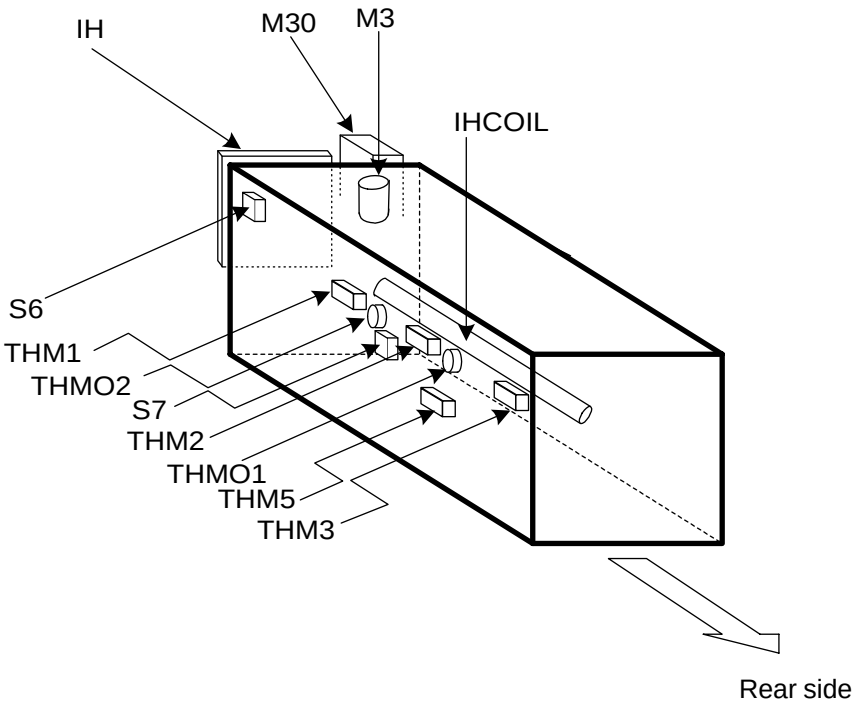
[C] Laser unit



[D] Transfer/Transport unit

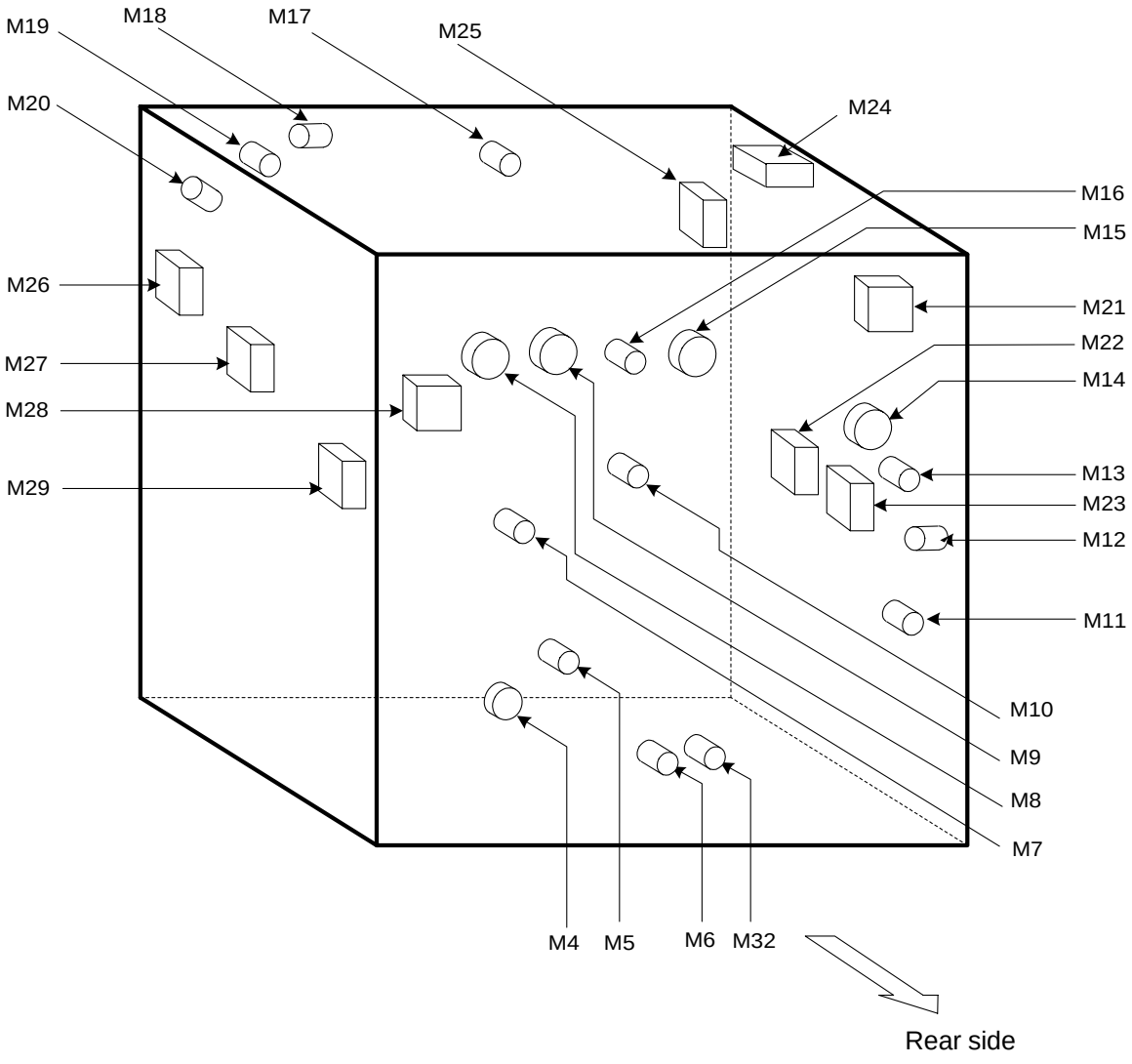


[E] Fuser unit

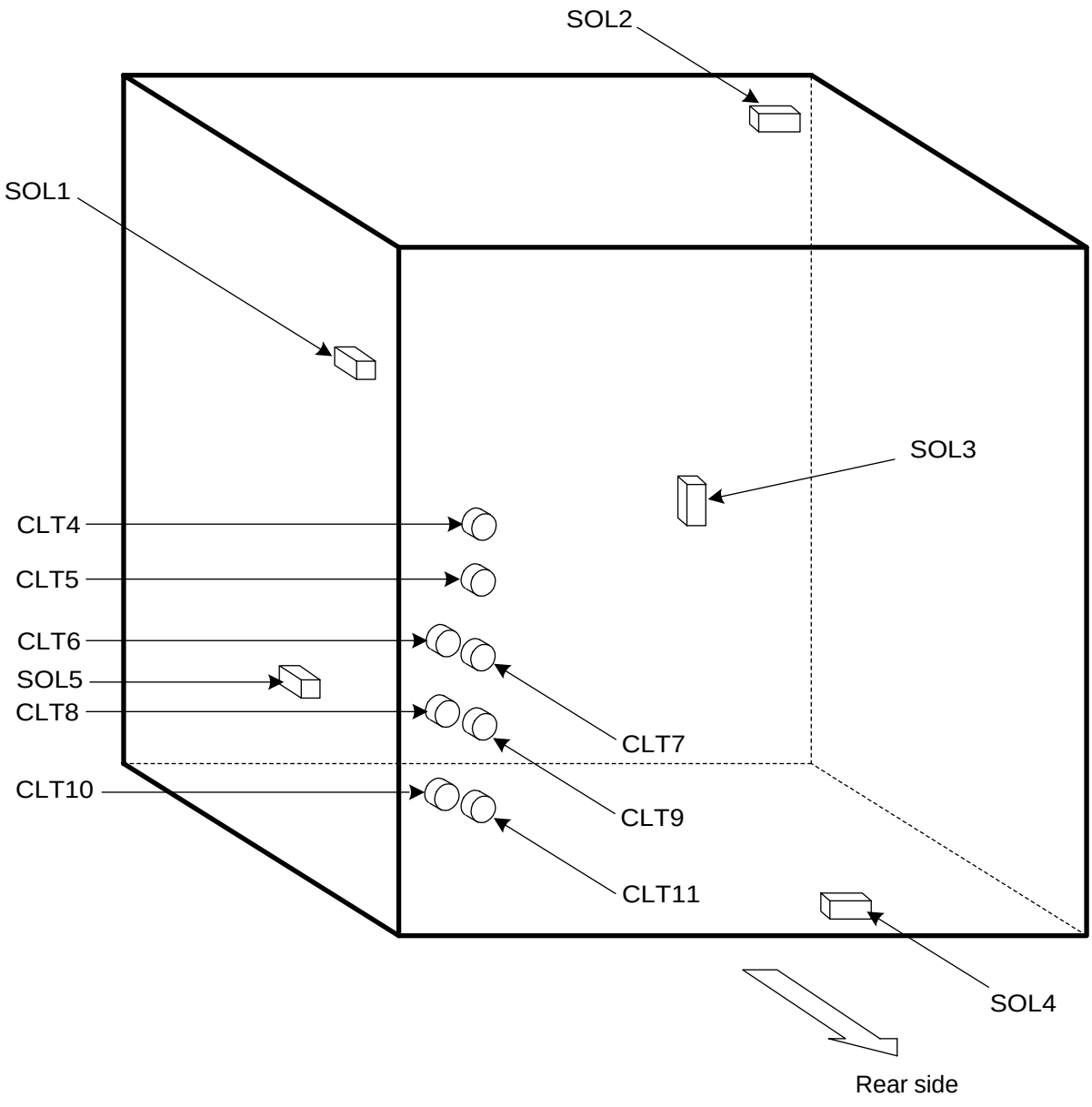

IH
M30
M3
IHCOIL
S6
THM1
THMO2
S7
THM2
THMO1
THM5
THM3
Rear side

[F] Copier unit

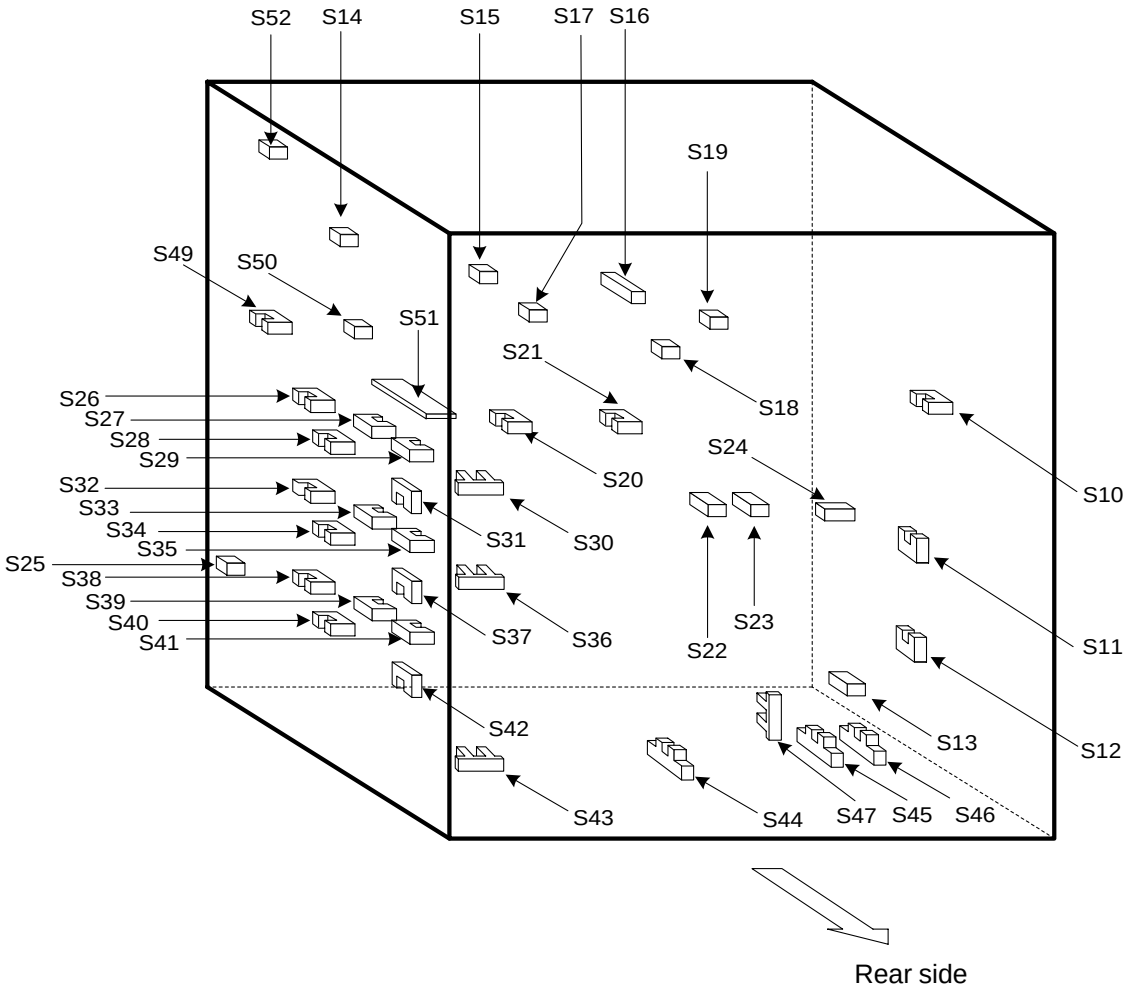
(F-1) Motor/Fan



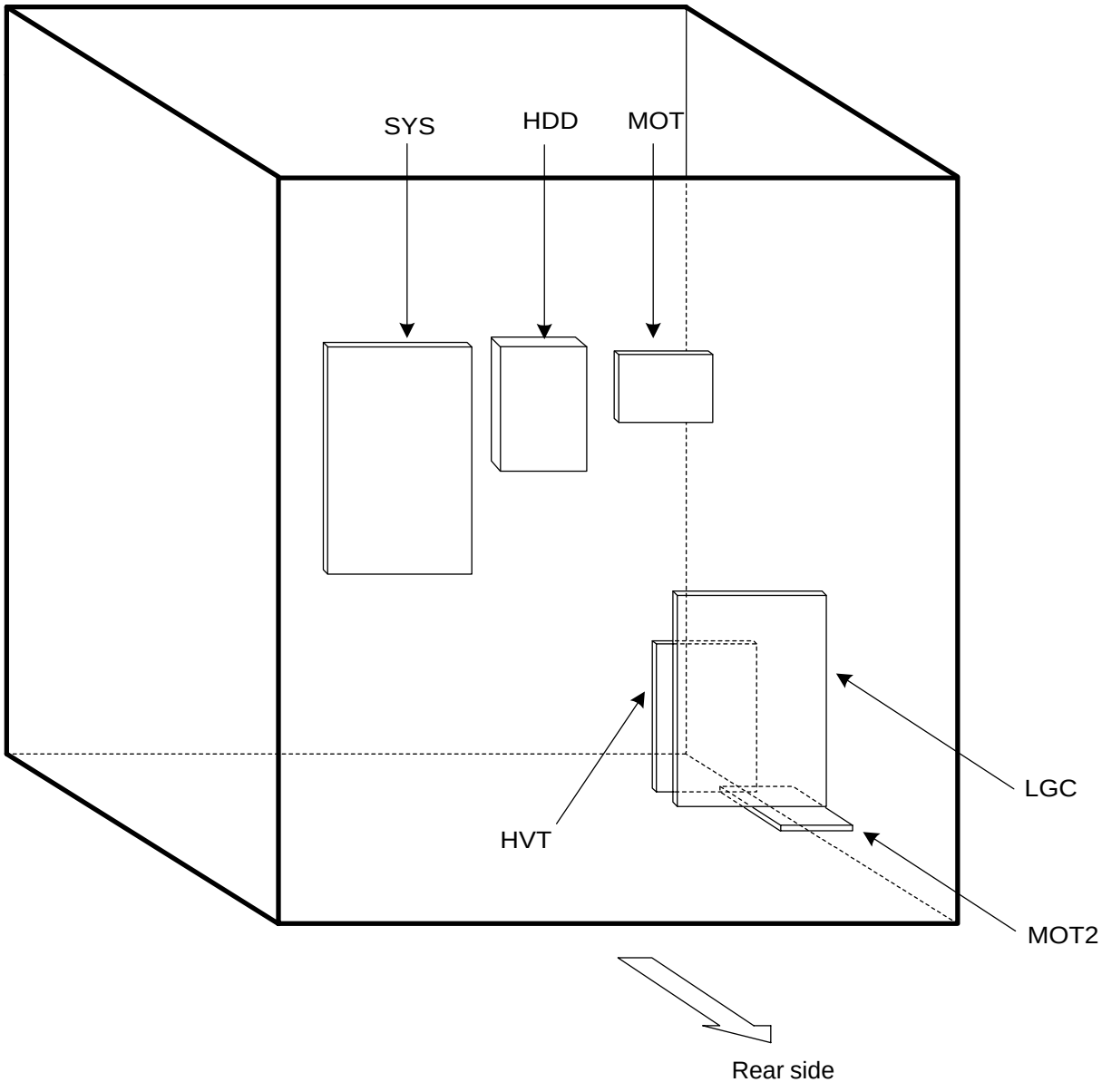
(F-2) Clutch/Solenoid



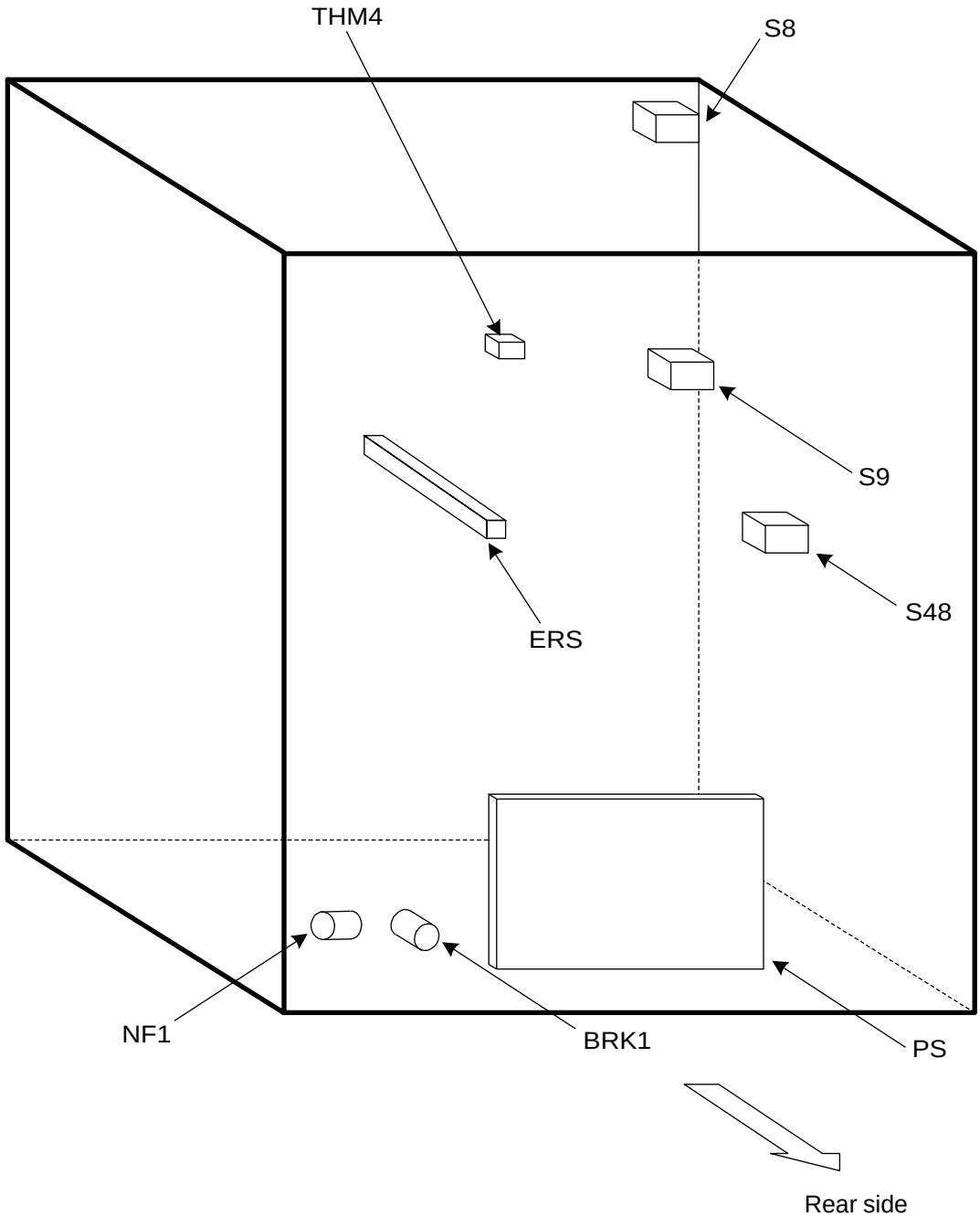
(F-3) Sensor/Switch



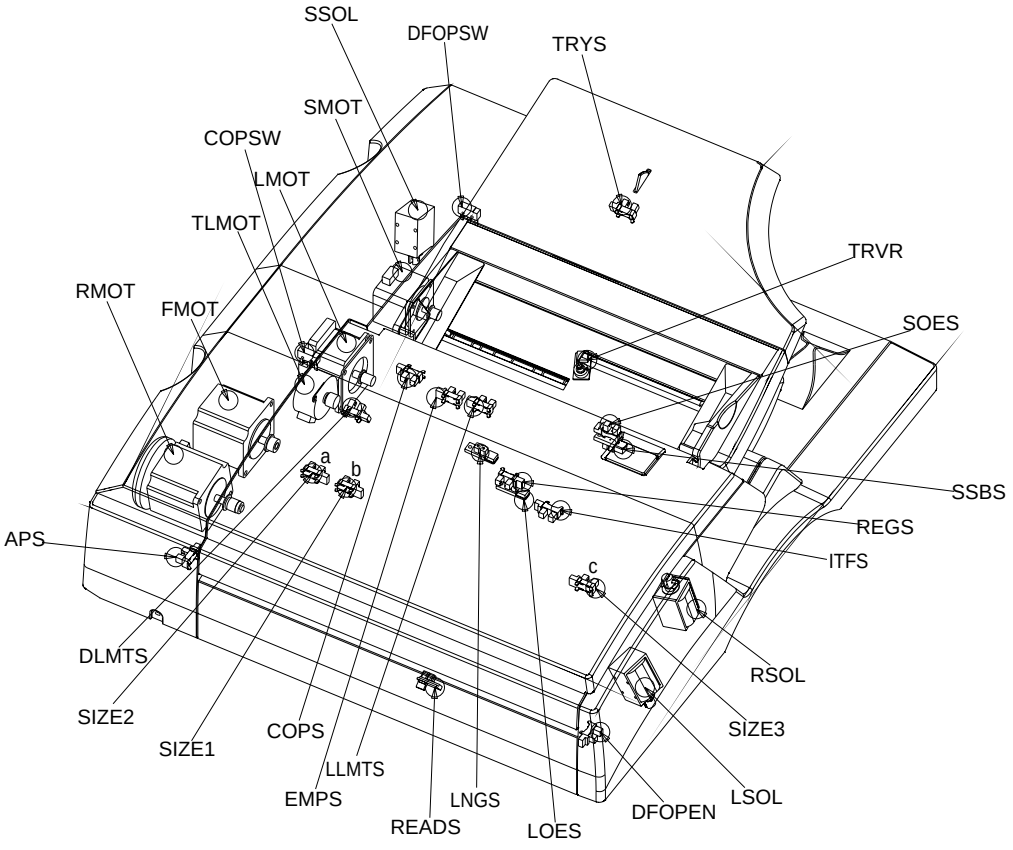
(F-4) PC board



(F-5) Other parts



[G] Reversing automatic document feeder



2. 3. Symbols and Functions of Various Components

The column <P-I> shows the page and item number in the parts list.

(1) Motors

Symbol	Name	Function	P-I	Remarks
M1	SCAN-MOT Scanner motor	Driving of the carriages	33-6	(B-1)
M2	M/DC-POL Polygonal motor	Driving of the polygonal mirror	31-10	[C]
M3	WEB-MOT Web motor	Cleaning web take-up	25-29	[E]
M4	FEED-MOT Feed motor	Driving of the feeding section	6-2	(F-1)
M5	CST-TRY-MOT1 Cassette tray-up motor	Driving ups of the 1st and 2nd cassettes	6-20	(F-1)
M6	CST-TRY-MOT2 Casette tray-up motor 2	Driving ups of the tandem LCF tray	6-20	(F-1)
M7	RGST-MOT Registration motor	Driving of the registration roller	6-26	(F-1)
M8	DEV-MOT Developer unit motor	Driving of the developer unit	40-22	(F-1)
M9	DRUM-MOT Drum motor	Driving of the drum	39-18	(F-1)
M10	TRB-CAM-MOT Transfer belt cam motor	Contact/Release of the transfer belt	18-7	(F-1)
M11	REV-MOT Reverse motor	Driving of the reverse section	13-5	(F-1)
M12	USTNR-AUG-MOT Used toner transport motor	Recovery of the toner scraped with the transfer belt cleaning blade	45-2	(F-1)
M13	EXIT-MOT Exit motor	Driving of the exit roller	13-25	(F-1)
M14	FUSER-MOT Fuser motor	Driving of the fuser unit	24-5	(F-1)
M15	TRB-MOT Transfer belt motor	Driving of the transfer belt	18-26	(F-1)
M16	FUR-MOT Cleaning brush drive motor	Driving of the transfer belt cleaning brush	30-12	(F-1)
M17	CH-CLN-MOT Charger wire cleaner drive motor	Driving of the charger wire cleaner	37-8	(F-1)
M18	TNR-MOT New toner supply motor	Toner supply	44-27	(F-1)
M19	TNR-RCY-HOP-MOT Toner recycle hopper motor	Driving of the recycle toner hopper	46-15	(F-1)
M20	RCY-TNR-MOT Recycle toner transport motor	Transporting of the recycle toner	46-19	(F-1)
M21	HTR-FAN-MOT Heater fan motor	Cooling down of the copier inside	31-7	(F-1)

Symbol	Name	Function	P-I	Remarks
M22	ADU-FAN-MOT1 Reverse section fan motor 1	Cooling down the reverse section	15-12	(F-1)
M23	ADU-FAN-MOT2 Reverse section fan motor 2	Cooling down the reverse section	15-12	(F-1)
M24	EXIT-FAN-MOT Exit fan motor	Cooling down of the exit section	31-7	(F-1)
M25	DUCT-OUT-FAN-MOT Duct out fan motor	Sucking of ozone	31-7	(F-1)
M26	LSU-FAN-MOT Laser unit fan motor	Cooling down of the laser unit	31-7	(F-1)
M27	DUCT-IN-FAN-MOT Duct in fan motor	Cooling down of the copier inside	40-25	(F-1)
M28	SYS-FAN-MOT System fan motor	Cooling down of the copier inside	52-24	(F-1)
M29	DEV-FAN-MOT Developer unit fan motor	Sucking of the toner in the developer unit	40-13	(F-1)
M30	IH-FAN-MOT IH fan motor	Cooling down of the IH board	24-17	[E]
M31	SLG-FAN-MOT SLG fan motor	Cooling down of the SLG board	32-10	(B-1)
M32	END-F-MOT End fence motor	Moving of the end fence	9-22	(F-1)

(2) Sensos and switches

Symbol	Name	Function	P-I	Remarks
S1-5	APS 1-5 Automatic original detection sensor	Original size detection	36-6	(B-2)
S2	HOME-SNR Carriage home position sensor	Carriage home position detection	36-12	(B-2)
S3	TR-SNR 1 Transport sensor 1	Paper detection at the reversed paper transport path	20-23	[D]
S4	TR-SNR 2 Transport sensor 2	Paper detection at the reversed paper transport path	20-23	[D]
S5	TR-SNR 3 Transport sensor 3	Paper detection at the reversed paper transport path	20-23	[D]
S6	WEB-SNR Web detection sensor	Cleaning web take-up amount detection	25-8	[E]
S7	FUS-EXIT-SNR Fuser unit exit sensor	Paper detection at the fuser unit	25-8	[E]
S8	MAIN-SW Main switch	ON/OFF of the copier AC power supply	28-11	(F-5)
S9	DOOR-SW Front door switch	Turning OFF of the AC power supply when opening the front cover Interlock switch	28-24	(F-5)
S10	EXIT-SNR Exit sensor	Paper detection at the exit section	15-25	(F-3)
S11	RVS-SNR Reverse sensor 1	Paper detection at the reverse section	15-14	(F-3)
S12	RVS-SNR Reverse sensor 2	Paper detection at the reverse section	15-14	(F-3)
S13	EXIT-COV-SW Exit cover switch	Cover open/close detection at the exit cover	15-11	(F-3)
S14	DEV-SW Developer unit switch	Detection of the developer unit presence or absence	5-16	(F-3)
S15	TNR-SW Toner cartridge switch	Toner cartridge detection	44-18	(F-3)
S16	DRUM-SUF-SNR Drum surface potential sensor	Detection of the drum surface potential	5-13	(F-3)
S17	ATTNR-SNR Auto-toner sensor	Toner density detection	42-26	(F-3)
S18	TNLVL-SNR Image quality sensor	Toner adhesion amount detection	49-16	(F-3)
S19	CH-HOME-SW Wire cleaner home position switch	Detection of the wire cleaner home position	37-13	(F-3)
S20	MID-TR-SNR Intermediate transport sensor	Paper detection at the feeding section	17-6	(F-3)
S21	RGST-SNR Registration sensor	Paper detection at the registration section	16-6	(F-3)
S22	TR-BELT-SW 1 Transfer belt release switch	Transfer belt release position detection	18-3	(F-3)

Symbol	Name	Function	P-I	Remarks
S23	TR-BELT-SW 2 Transfer belt contact switch	Transfer belt contact position detection	18-2	(F-3)
S24	TNR-FULL-SNR Toner bag full detection sensor	Used toner full detection	45-17	(F-3)
S25	COV-R-SNR Feed cover sensor	Feed cover open/close detection	28-7	(F-3)
S26	CST1-TR-SNR 1st cassette transport sensor	1st cassette paper detection	7-18	(F-3)
S27	CST1-TRY-SNR 1st cassette tray-up sensor	1st cassette tray position detection	7-18	(F-3)
S28	CST1-FED-SNR 1st cassette feed sensor	1st cassette paper detection	7-18	(F-3)
S29	CST1-EMP-SNR 1st cassette empty sensor	Detection of 1st cassette paper presence or absence	7-18	(F-3)
S30	CST1-BTM-SNR 1st cassette bottom sensor	1st cassette position lower limit detection	7-18	(F-3)
S31	CST1-SNR 1st cassette detection sensor	Detection of 1st cassette presence or absence	7-18	(F-3)
S32	CST2-TR-SNR 2nd cassette transport sensor	2nd cassette paper detection	7-18	(F-3)
S33	CST2-TRY-SNR 2nd cassette tray-up sensor	2nd cassette tray position detection	7-18	(F-3)
S34	CST2-FED-SNR 2nd cassette feed sensor	2nd cassette paper detection	7-18	(F-3)
S35	CST2-EMP-SNR 2nd cassette empty sensor	Detection of 2nd cassette paper presence or absence	7-18	(F-3)
S36	CST2-BTM-SNR 2nd cassette bottom sensor	2nd cassette position lower limit detection	7-18	(F-3)
S37	CST2-SNR 2nd cassette detection sensor	Detection of 2nd cassette presence or absence	7-18	(F-3)
S38	LCF-TR-SNR Tandem LCF transport sensor	Paper detection at the tandem LCF feeder section	7-18	(F-3)
S39	LCF-TRY-SNR Tandem LCF tray-up sensor	Tandem LCF tray position detection	7-18	(F-3)
S40	LCF-FED-SNR Tandem LCF feed sensor	Paper detection at the tandem LCF feeder section	7-18	(F-3)
S41	LCF-EMP-SNR Tandem LCF empty sensor	Detection of paper presence or absence at tandem LCF	7-18	(F-3)
S42	LCF-SNR Tandem LCF detection sensor	Detection of the tandem LCF tray presence or absence	7-18	(F-3)
S43	LCF-BTM-SNR Tandem LCF bottom sensor	Tray home position detection	8-14	(F-3)
S44	END-F-STP-SNR End fence stop position sensor	End fence stop position detection	8-14	(F-3)

Symbol	Name	Function	P-I	Remarks
S45	EMP-SNR-SS Standby side empty sensor	Paper position detection at the standby side	18-14	(F-3)
S46	END-F-HP-SNR End fence home position sensor	End fence home position detection	18-14	(F-3)
S47	PR-MST-SS Standby side paper mis-stacking sensor	Detection of the paper mis-stacking at the standby side	18-16	(F-3)
S48	HTR-SW Fuser unit switch	Detection of the fuser unit presence or absence	24-7	(F-5)
S49	SFB-COV-SNR Bypass feed unit cover sensor	Open/close detection of the bypass feed unit cover	28-7	(F-3)
S50	SFB-FED-SNR Bypass sensor	Paper detection at the bypass feeding	10-23	(F-3)
S51	SFB-SIZE-SNR Bypass paper size detection sensor	Paper size detection at the bypass feed width detection	12-9	(F-3)
S52	TEMP/HUMI-SNR Temperature/humidity sensor	Detection of the temperature and humidity of the copier inside	3-103	(F-3)

(3) Electromagnetic spring clutches

Symbol	Name	Function	P-I	Remarks
CLT1	TR-DRV-CLT Reversed paper transport driving clutch	Driving of the reversed paper transport section	19-21	[D]
CLT2	REV-TR1-CLT Reversed paper transport clutch 1	Reversed paper transporting	20-21	[D]
CLT3	REV-TR2-CLT Reversed paper transport clutch 2	Reversed paper transporting	20-21	[D]
CLT4	MDL-TR-CLT Intermediate transport clutch	Paper transporting	17-23	(F-2)
CLT5	SFB-FEED-CLT Bypass feed clutch	Driving of the bypass pickup roller	11-13	(F-2)
CLT6	CST1-TR-CLT 1st cassette transport clutch	1st cassette paper transporting	7-26	(F-2)
CLT7	CST1-FED-CLT 1st cassette feed clutch	Driving of 1st cassette pickup roller	7-26	(F-2)
CLT8	CST2-TR-CLT 2nd cassette transport clutch	2nd cassette paper transporting	7-26	(F-2)
CLT9	CST2-FED-CLT 2nd cassette feed clutch	Driving of 2nd cassette pickup roller	7-26	(F-2)
CLT10	LCF-TR-CLT Tandem LCF transport clutch	Tandem LCF paper transporting	7-26	(F-2)
CLT11	LCF-FED-CLT Tandem LCF feed clutch	Driving of the tandem LCF pickup roller	7-26	(F-2)

(4) PC boards

Symbol	Name	Function	P-I	Remarks
SLG	PWA-F-SLG Scanning section control PC board (SLG board)	Control of the scanning section and image processing	36-1	(B-3)
CCD	PWA-F-CCD CCD driving PC board (CCD board)	Preprocessing control of the CCD image data	32-17	(B-3)
SYS	PWA-F-SYS System PC board (SYS board)	Control of the whole copier Data processing	52-10	(F-4)
LGC	PWA-F-LGC Logic PC board (LGC board)	Control of the whole copier	52-14	(F-4)
LDR1	PWA-F-LDR1 Laser driving PC board 1 (LDR board 1)	Driving of the laser diode	31-10	[C]
LDR2	PWA-F-LDR2 Laser driving PC board 2 (LDR board 2)	Driving of the laser diode	31-10	[C]
SNS	PWA-F-SNS H-Sync detection PC board	Detection of the laser beam position	31-10	[C]
IH	PS-IH IH control board	Control of the fuser unit IH coil	24-16	[E]
FUSE	PWA-F-FUS Fuse PC board	Cutting of the electric current to the damp heater	21-30	[D]

Symbol	Name	Function	P-I	Remarks
MOT	PWA-F-MOT Motor driving PC board	Driving of the drum motor and transfer belt motor	24-21	(F-4)
MOT2	PWA-F-MOT2 Motor driving PC board 2	Driving of the reverse motor	13-19	(F-4)
PLG	PWA-F-PLG Laser control PC board (PLG board)	Control of the printing section and image processing	31-16	[C]

(5) Heaters and lamps

Symbol	Name	Function	P-I	Remarks
EXP	LP-EXPO Exposure lamp	Exposing of original to the light	34-3	(B-1)
DHR	DNP-HTR-R Scanner damp heater (R)	Preventing of the condensation in the scanning section (for mirrors)	36-11	(B-4)
DHL	DNP-HTR-L Scanner damp heater (L)	Preventing of the condensation in the scanning section (for lens)	36-9	(B-4)
DHD	D-HTR Drum damp heater	Keeping of the drum warm	21-28	[D]
IHCOIL	IH-COIL IH coil	Heating up of the fuser roller	25-36	[E]

(6) Solenoid

Symbol	Name	Function	P-I	Remarks
SOL1	SFB-SOL Bypass pickup solenoid	Driving of the bypass pickup roller	10-8	(F-2)
SOL2	GATE-SOL Gate solenoid	Switching of the gate at the reverse section	15-2	(F-2)
SOL3	SEP-FING-SOL Drum separation finger solenoid	Driving of the drum separation finger	30-17	(F-2)
SOL4	END-F-SOL End fence solenoid	Moving of the lever to detect the paper mis-stacking at the standby side tray	8-9	(F-2)
SOL5	LCF-PICK-SOL Tandem LCF pickup solenoid	Driving of the Tandem LCF pickup roller	7-36	(F-2)

(7) Transformer

Symbol	Name	Function	P-I	Remarks
HVT	PS-HVT High-voltage transformer	Generating of the voltages for the followings: • main charger wire • main charger grid • developer bias • drum cleaning brush	51-19	(F-4)

(8) Others

Symbol	Name	Function	P-I	Remarks
INV	INV-EXP Lamp inverter	Control of the exposure lamp	34-4	(B-3)
HDD	HDD Hard disk	Storing of the image data	52-16	(F-4)
GLV	MIR-GLV Galvanometer mirror	Control of the laser	31-10	[C]
PS	PS-ACC Switching power supply	Power supplying	51-18	(F-5)
THMO1	THERMO-HTR Center thermostat	Preventing of the fuser unit over-heating	26-4	[E]
THMO2	THERMO-S-HTR Side thermostat	Preventing of the fuser unit over-heating	26-4	[E]
THMO3	DAMP-HTR Dump heater thermostat	Preventing of the dump heater over-heating	21-31	[D]
THMO4	THERMO-EXP Expousre lamp thermostat	Preventing of the dump heater over-heating in scanner section	36-9	(B-4)
THM1	THMS-S-HTR Fuser roller side thermistor (front)	Detection of the surface temperature at the drum edges/Abnormal detection	26-6	[E]
THM2	THMS-HTR Fuser roller center thermistor	Detection of the surface temperature at the drum center	26-6	[E]
THM3	THMS-S-HTR Fuser roller side thermistor (rear)	Detection of the surface temperature at the drum edges	26-6	[E]
THM4	THMS-DRM Drum thermistor	Detection of the drum surface	49-12	(F-5)
THM5	THMS-L-HTR Pressure roller thermistor	Detection of the surface temperature of the pressure roller	26-28	[E]
NF1	NOIZ-FILTER1 Noize filter 1	Noize cut	51-7	(F-5)
BRK1	BREAKER1 Breaker 1	Safety switch	51-6	(F-5)
BRK2	BREAKER2 Breaker 2	Safety switch	51-6	(F-5)
ERS	CD-ERS Discharge lamp	Removing of the residual charge from the drum surface	37-11	(F-5)

2. 4. Symbols and Functions of RADF Various Components

(1) Motors

Symbol	Name	Function	Remarks
RMOT	RMOT Read motor	·Driving of the transport roller	Stepping motor (P83-I27)
SMOT	SMOT Small original exit motor	·Driving of the small original exit roller and small original reverse roller	Stepping motor (P87-I14)
TLMOT	UDMOT Tray lift motor	·Driving of the tray lift motor	Stepping motor (P86-I20)
FMOT	FMOT Feed motor	·Driving of the feed roller, pickup roller and registration roller	Stepping motor (P86-I19)
LMOT	LMOT Large original exit motor	·Driving of the large original exit roller and large original reverse roller	Stepping motor (P87-I13)

(2) Solenoids

Symbol	Name	Function	Remarks
ESSOL	ESSOL Disengagement solenoid	·Disengagement of the large original exit roller	DC solenoid (P89-I4)
LSOL	LSOL Large original exit solenoid	·Switching of the large original exit flapper	DC solenoid (P89-I3)
SSOL	SSOL Small original exit solenoid	·Switching of the small original exit flapper and reverse flapper	DC solenoid (P87-I1)

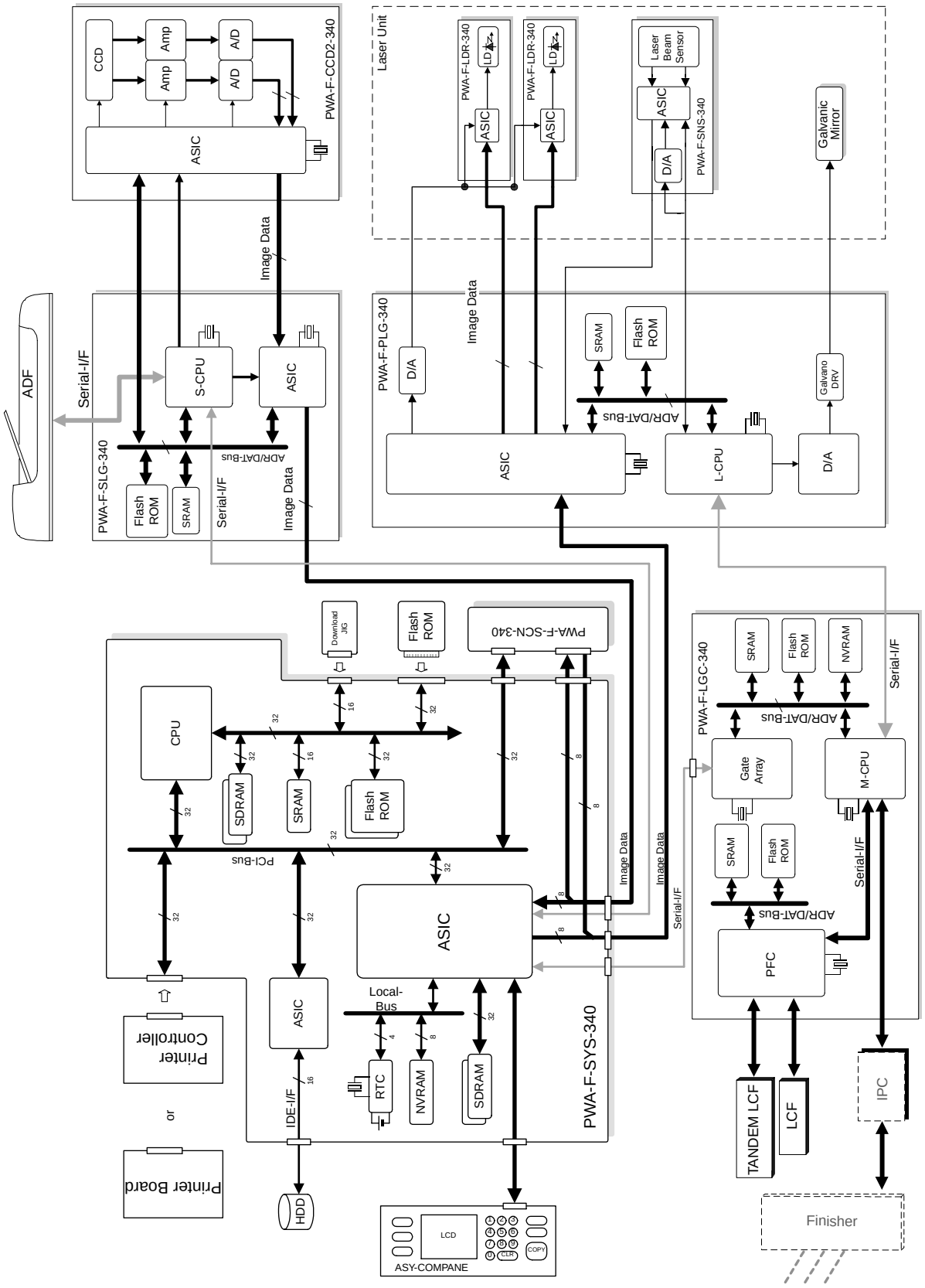
(3) PC boards

Symbol	Name	Function	Remarks
DFLG	PWA-F-ADF ADF PC control board (ADF board)	·Control of the ADF	(P88-I13)

(4) Switches and sensors

Symbol	Name	Function	Remarks
COPSW	COV-OPN-SW Cover open/close switch	Detecting if the jam access cover is opened/closed (Interlock switch)	Micro switch (P86-I13)
DFOPSW	DF-OPN-SW RADF open/close switch	Detecting if RADF is opened/closed (Interlock switch)	Micro switch (P88-I101)
DFOPNS	DF-OPN-SNS RADF open/close sensor	Detecting if RADF is opened/closed	Semiconductive photosensor (P89-101)
APS	AUTO-PS-SNS APS operation sensor	Detecting the angle opened and switching ON/OFF of the APS sensor	Semiconductive photosensor (P86-I105)
COPS	COV-OPN-SNS Cover open/close sensor	Detecting if the jam access cover is opened/closed	Semiconductive photosensor (P81-I29)
EMPS	EMP-SNS Empty sensor	Detecting the presence or absence of original during feeding	Semiconductive photosensor (P81-I29)
ULMTS	UP-LMT-SNS Upper limit sensor	Detecting the upper limit of the lifting tray	Semiconductive photosensor (P81-I29)
SIZES1	SIZE-SNS1 Original width sensor 1	Detecting the original width	Semiconductive photosensor (P91-I103)
SIZES2	SIZE-SNS2 Original width sensor 2	Detecting the original width	Semiconductive photosensor (P91-I103)
SIZES3	SIZE-SNS3 Original width sensor 3	Detecting the original width	Semiconductive photosensor (P91-I103)
REGS	REG-SNS Registration sensor	Detecting original at the registering section	Semiconductive photosensor (P91-I103)
TRYS	TRY-SNS Tray sensor	Detecting the original length on the tray	Semiconductive photosensor (P93-I102)
LLMTS	LO-LMT-SNS Lower limit sensor	Detecting the lower limit of the lifting tray	Semiconductive photosensor (P82-I36)
ITFS	INT-F-SNS Intermediate transport sensor	Detecting original on the small original transport path	Semiconductive photosensor (P90-I103)
SOES	SO-EX-SNS Small original exit sensor	Detecting original at the small original exit	Semiconductive photosensor (P84-I105)
READS	READ-SNS Read sensor	Detecting original at the scanning section	Semiconductive photosensor (P83_I36)
LNGS	LENG-SNS Original length sensor	Detecting the original length	Semiconductive photosensor (P82-I31)
SSBS	SO-SB-SNS Small original reverse sensor	Detecting original at the small original reverse section	Semiconductive photosensor (P84-I31)
TRVR	TRY-VR Tray width sensor	Detecting the original width on the tray	Rotary volume (P93-I6)
LOES	LO-EX-SNS Large original exit sensor	Detecting original at the large original exit	Semiconductive photosensor (P85-I15)

2. 5. System Block Layout



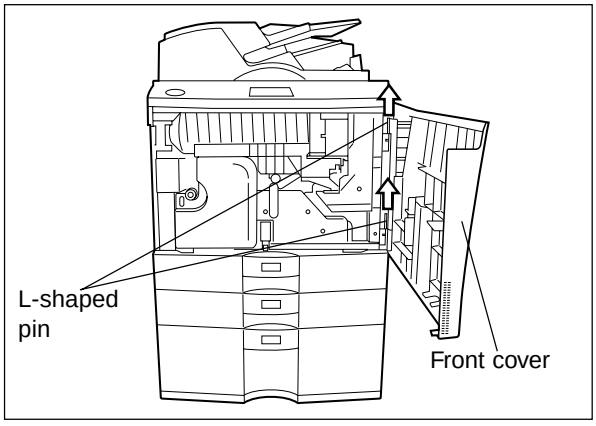
2. 6. Disassembly and Replacement of Covers and PC boards

2. 6. 1. Covers

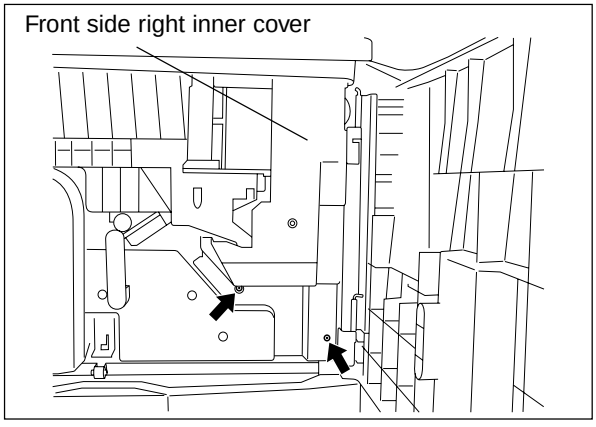
[A] Front cover/Front side right inner cover

(1) Open the front cover.

(2) Pull out 2 L-shaped pins and take off the front cover.



(3) Remove 2 screws and take off the front side right inner cover.

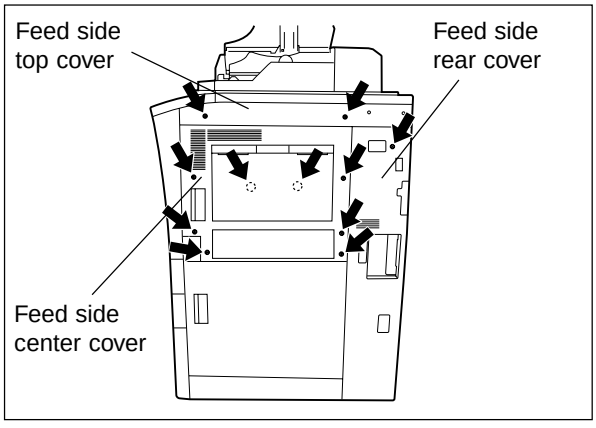


[B] Feed side rear cover/Feed side top cover/ Feed side center cover

(1) Remove 1 screw and take off the feed side rear cover.

(2) Remove 2 screws and take off the feed side top cover.

(3) Open the bypass unit tray and remove 2 screws. Then remove 6 screws and take off the feed side center cover.

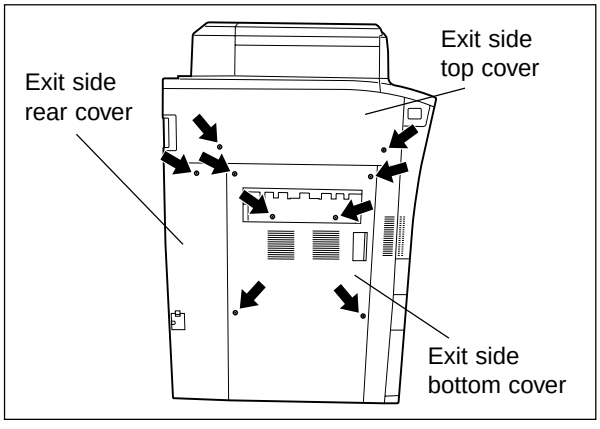


[C] Exit side top cover/Exit side rear cover/ Exit side bottom cover

(1) Remove 2 screws and take off the exit side top cover.

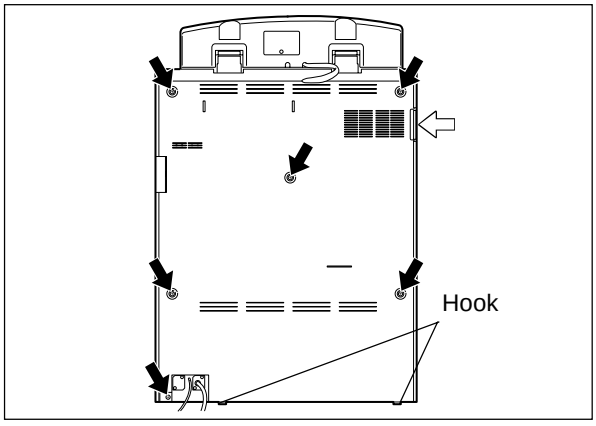
(2) Remove 1 screw and take off the exit side rear cover.

(3) Remove 6 screws and take off the exit side bottom cover.



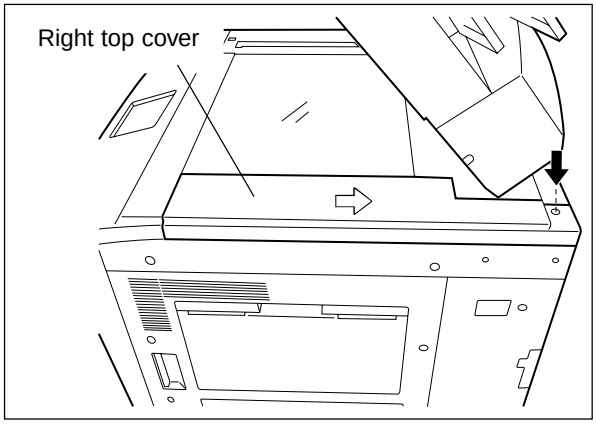
[D] Rear cover

(1) Loosen 1 screw (shown by a white arrow), remove 6 screws, release 2 hooks and take off the rear cover.



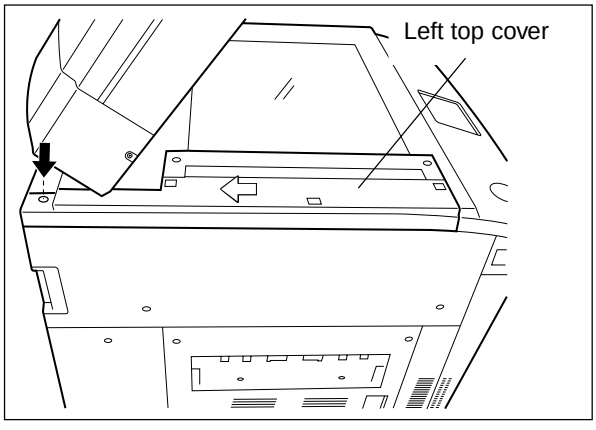
[E] Right top cover

(1) Remove 1 screw and take off the right top cover.



[F] Left top cover

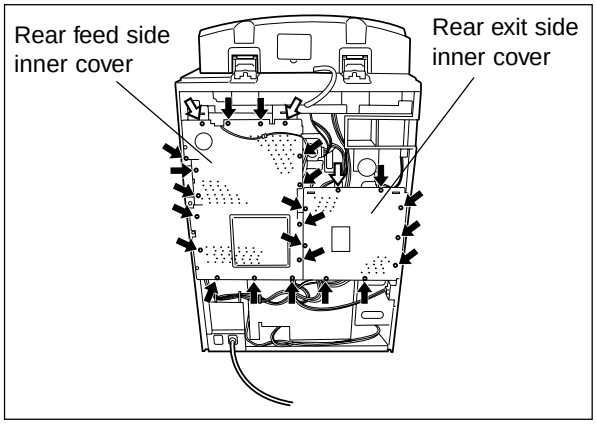
(1) Remove 1 screw and take off the left top cover.



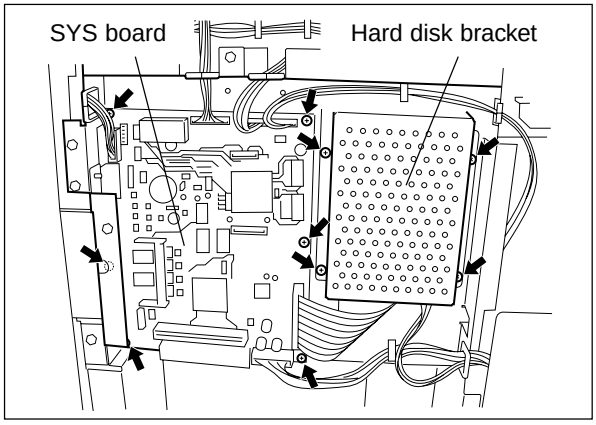
2. 6. 2. PC boards

[A] System control board (SYS board)/Hard disk/ Logic board (LGC board)

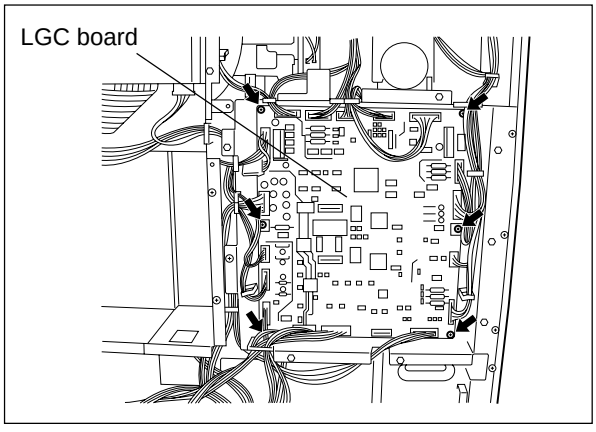
(1) Remove the rear cover.
(2) Disconnect 1 connector.
(3) Remove 2 screws (shown by 2 white arrows), loosen 14 screws and take off the rear feed side inner cover (plate cover).
(4) Remove 1 screw (shown by a white arrow), loosen 8 screws and take off the rear exit side inner cover (plate cover).



(5) Disconnect 7 connectors, remove 6 screws and take off the SYS board.
(6) Disconnect 2 connectors, remove 4 screws and take off the hard disk with the bracket.
(7) Remove 4 screws and release the hard disk from the bracket.

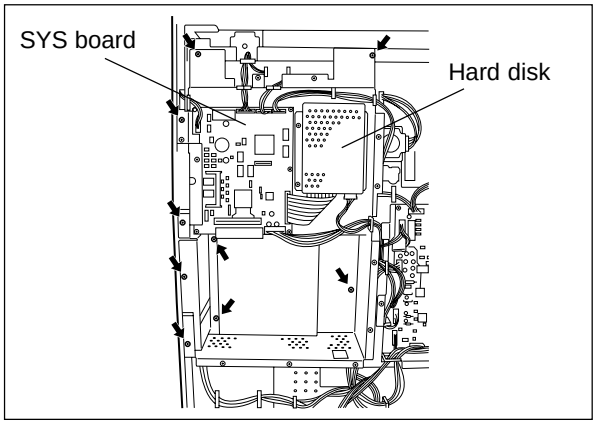


(8) Disconnect 19 connectors, remove 6 screws and take off the LGC board.

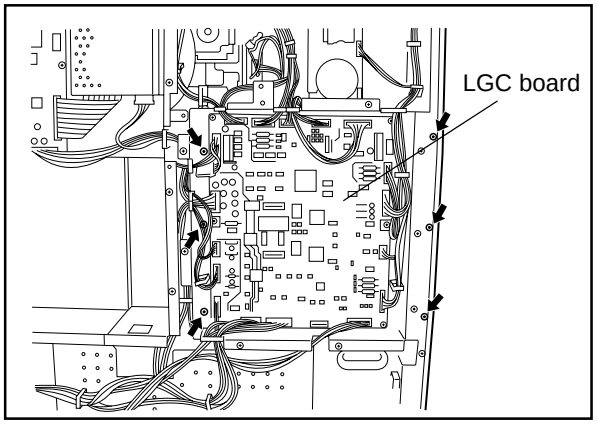


[B] High-voltage transformer

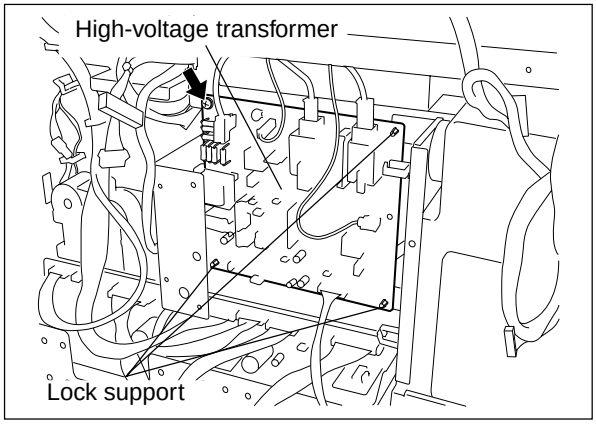
(1) Disconnect 7 connectors to the SYS board and hard disk.
(2) Remove 9 screws and take off the bracket with the LGC board and hard disk.



(3) Disconnect 19 connectors to the LGC board.
(4) Remove 6 screws and take off the bracket with the LGC board.

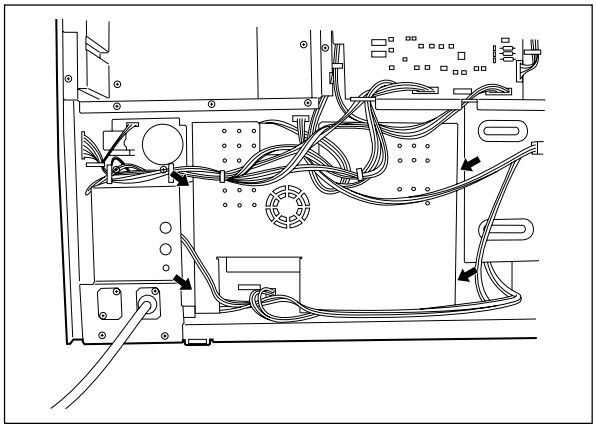


(5) Disconnect 6 connectors, remove 1 screw, release 3 lock supports and take off the high-voltage transformer.



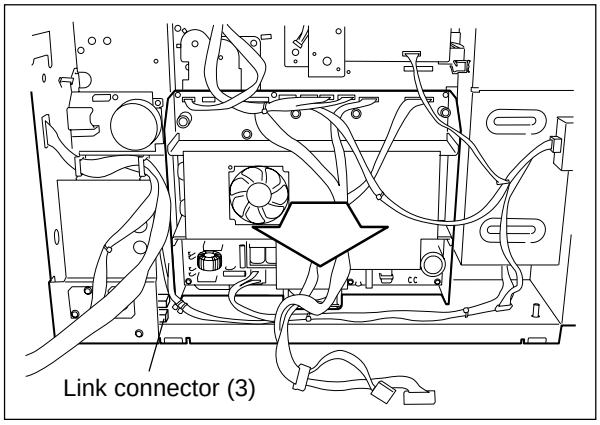
[C] Power supply unit

(1) Remove the SYS board, hard disk and LGC board with the bracket.
(2) Remove 4 screws and take off the bracket of the power supply unit.



(3) Disconnect 1 link connector.
(4) Remove 9 connectors and pull out the power supply unit.

Note: Be careful not for the power supply unit to be caught by harnesses.



3. COPY PROCESS

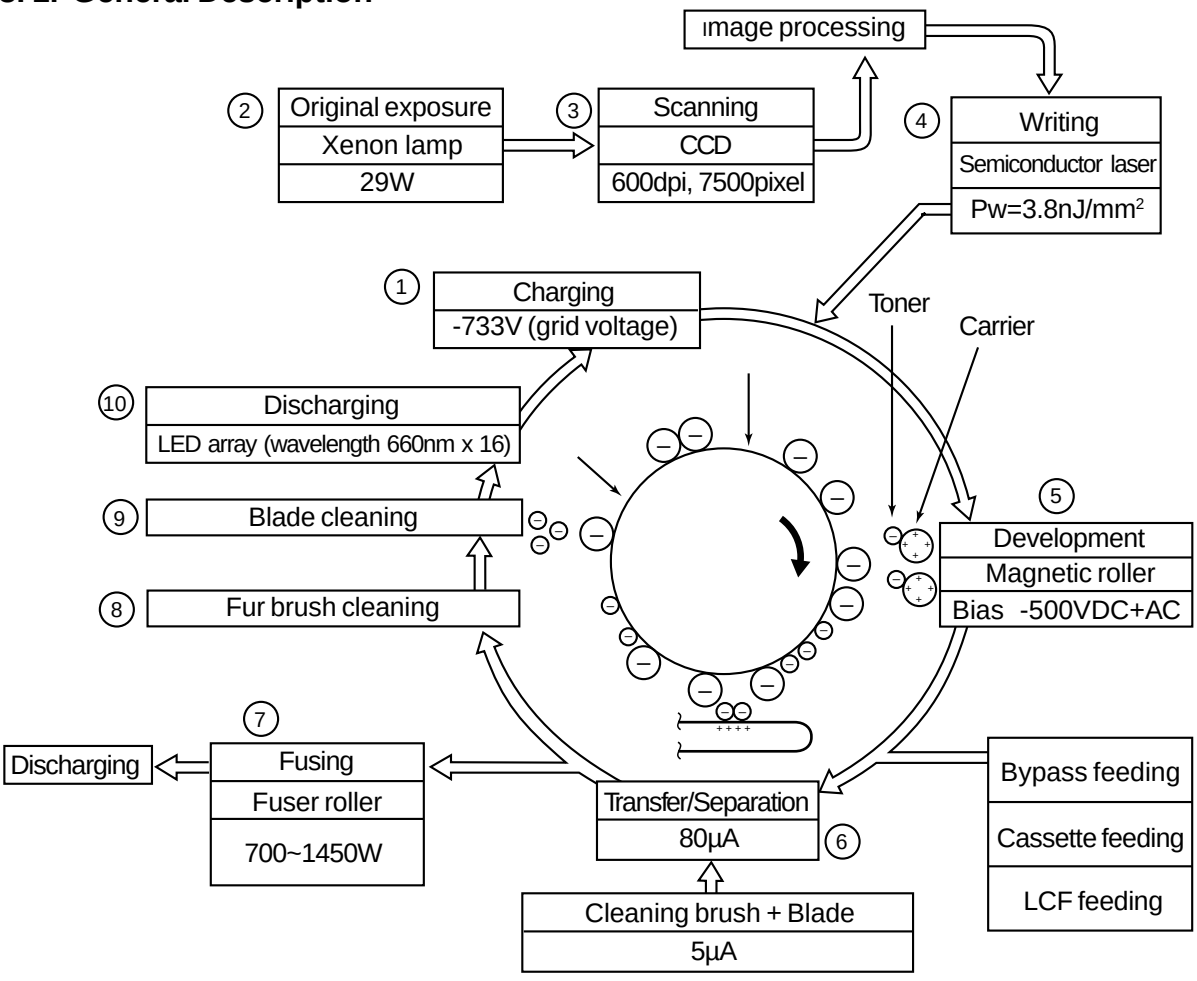
3. 1. General Description

3. 2. Details of Copy Process

3. 3. Comparison of Copy Process to 6570/5570

3. COPY PROCESS

3. 1. General Description



(1) Charging: Negatively charges the surface of the photoconductive drum.

↓

(2) Original exposure: Converts images into optical signals.

↓

(3) Scanning: Converts image optical signals into electrical signals.

↓

(4) Writing: Converts image electrical signals into optical signals (laser emission) and exposes them to the surface of the photoconductive drum.

↓

(5) Development: Makes the negatively-charged toner adhere to the photoconductive drum and forms a visible image.

↓

(6) Transfer: Transfers the visible image on the photoconductive drum onto a paper.
Separation: Separates the paper from the drum together with the toner.

↓

(7) Fusing: Fuses the toner on the paper by applying heat and pressure.

↓

(8) Fur brush cleaning: Cleans dirt and paper dust on the drum.

↓

(9) Blade cleaning: Forcibly removes the residual toner on the drum.

↓

(10) Discharging: Discharges any remaining negative charge on the drum.

3. 2. Details of Copy Process

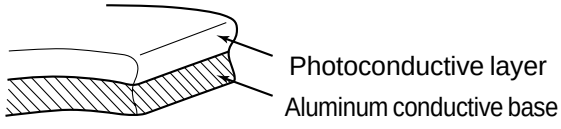
(1) Photoconductive drum

The photoconductive drum has two layers, an outer and an inner layer. The outer layer is a photoconductive layer made of an organic photoconductive carrier (OPC). The inner layer is an aluminum conductive base in a cylindrical form.

The photoconductive carrier has the characteristic that its electrical resistance changes depending on the strength of the light exposed.

Example:

· Strong light→
  Resistance is decreased (works as a conductor.)
· Weak light→
  Resistance is increased (works as an insulator.)

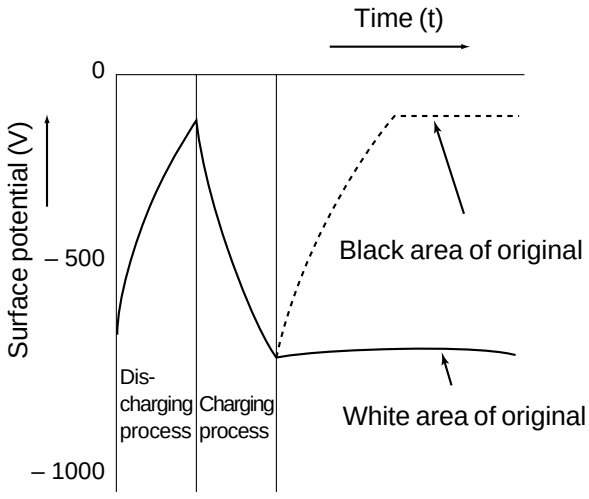


Structure of the photoconductive drum (OPC)

[Formation of electrostatic latent image]

In the processes of charging, scanning, printing and discharging described below, negative potential on the areas of the drum corresponding to black areas of the original is eliminated, while the areas of the drum corresponding to white areas remains the negative charge.

As this image on the drum formed by the negative potential is invisible, it is called an "electrostatic latent image."



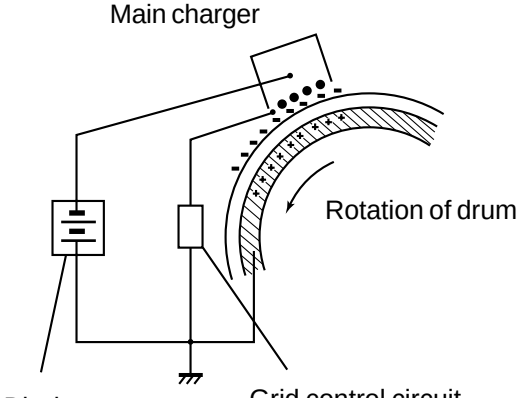
Electric potential on the photoconductive drum

(2) Charging

Charging is a process of uniformly applying a charge uniformly to the photoconductive drum surface.

The charger wire produces a negative corona discharge, which is controlled by the grid so that the drum surface is uniformly charged with negative potential.

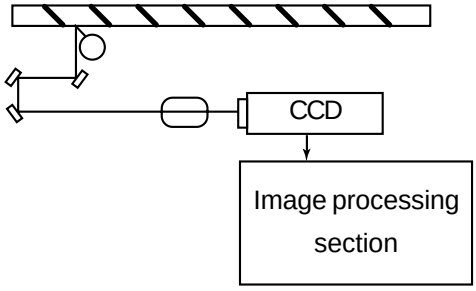
The surface potential on the drum is determined by the grid potential and controlled to a certain value by the grid control circuit.



(3) Scanning

Scanning is a process of exposing the original to the light and converting the reflection into electrical signals.

The light reflected from the original is imported to the charge coupled device (CCD) and this optical image information is converted into electrical signals (image signals), which are then sent to the image processing section.

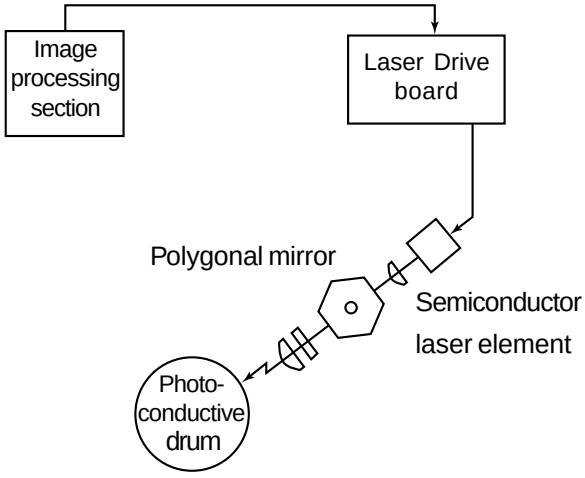


(Example)

CCD light receiving amount	Value of image signals to be output
Light	255
	Difference between "light " and "dark" is divided into 256 steps.
Dark	0

(4) Writing

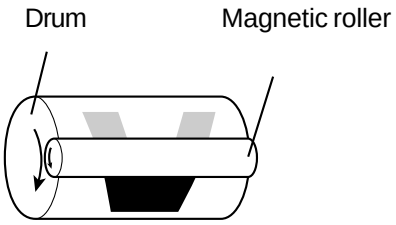
Writing is a process of converting the image signals sent from the image processing section into optical signals and exposing the drum surface to the light. Semiconductor laser element converts image signals sent from the image processing section into optical signals (laser emission) and exposes the drum surface to the light to form an electrostatic latent image on it.

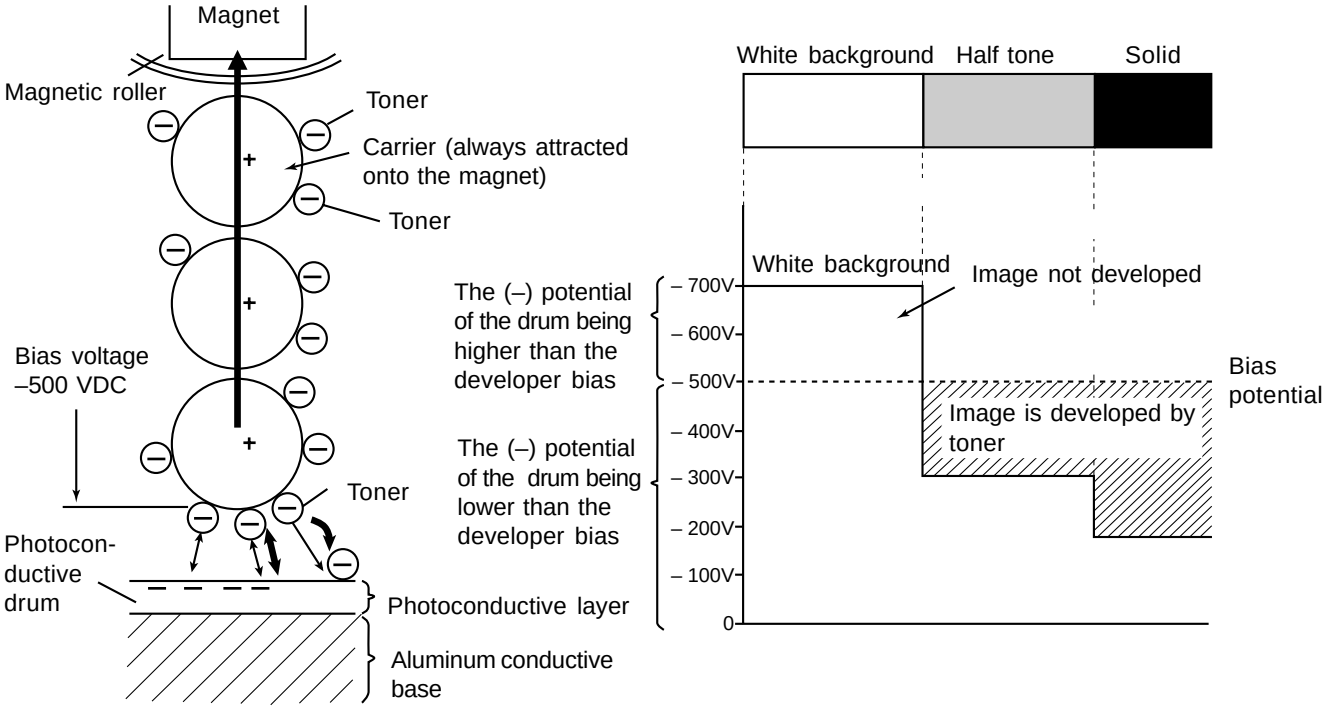


(5) Development

Development is a process of making the electrostatic latent images visible to the eye (visible images).

Developer material is supplied to the photoconductive drum surface by magnetic roller. The toner in the developer material adheres to the areas on the drum surface where the potential is lower than the developer bias which is applied to the magnetic roller (reverse development method).



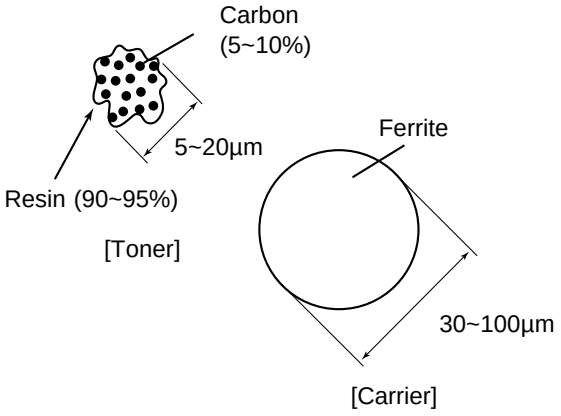


• Developer material

The developer material is a mixture of toner and carrier. The toner is charged to negative polarity and the carrier to positive polarity, due to the friction with each other caused by mixing.

Toner : Mainly consists of resin and carbon.

Carrier : Consists of ferrite and resin coating on its surface to provide consistent frictional electrification.



Note:

If the developer material is used for a long time (beyond its normal life span),

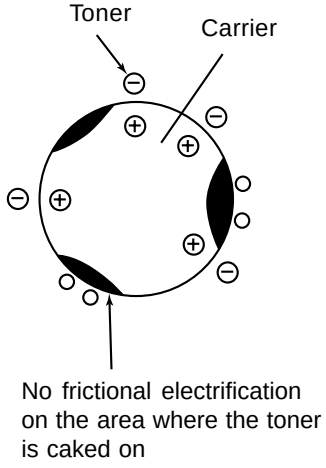
the toner is caked onto the carrier.

↓

The carrier's (charging) performance is lowered.

Symptom: 1. Image density is decreased.
2. Toner scattering occurs.
3. Background fogging occurs.

Solution: Replace new developer material.



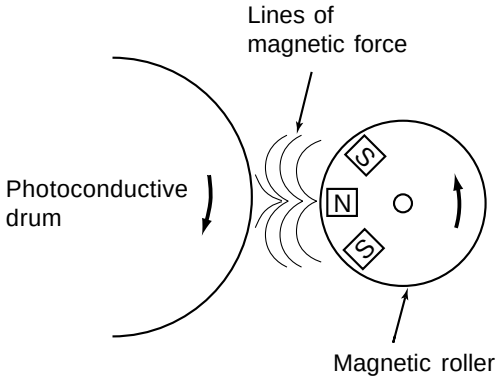
• Magnetic roller

- Magnetic brush development -

The south and north poles are arranged inside the magnetic rollers, as shown in the right figure. The developer material forms a brush-like fluff which contacts the photoconductive drum surface.

↓

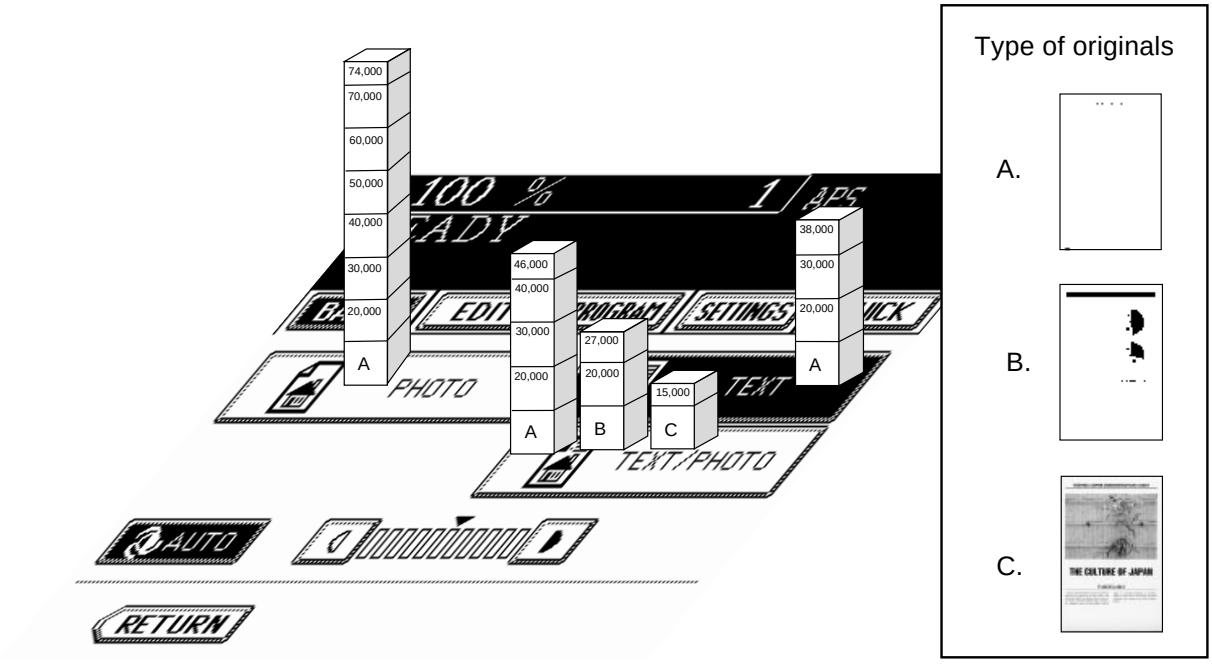
This is caused by the lines of magnetic force between the south and north poles.



● **Additional Explanation**

The life of the toner cartridge (number of copies) varies depending on the following conditions.

1. Coverage of originals (printing image ratio of the original size) and density of original background
2. Size and density of originals
3. The existence of solid black when making copies (when a book is copied and the original cover is partially open)
4. Temperature and humidity in the room when making copies
5. Copy density and image quality mode
   As indicated in the figure below, the life of the toner cartridge varies depending on the copy mode and coverage of originals



(6) Transfer/Separation

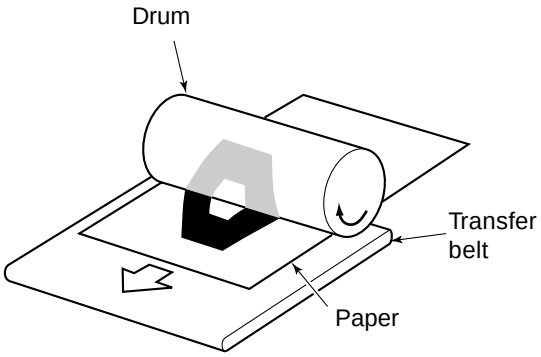
Transfer:

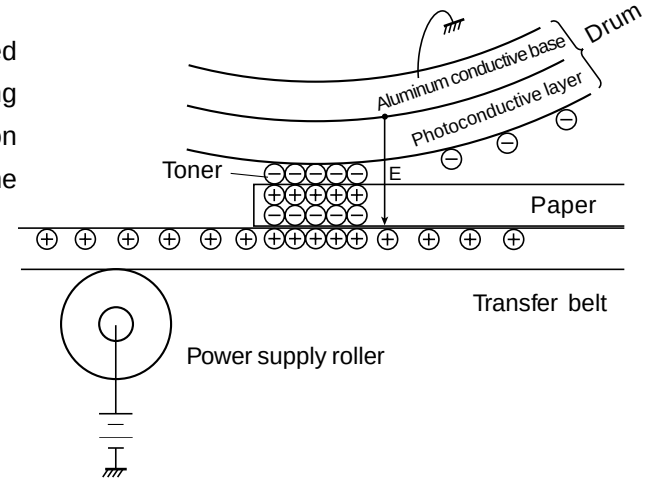
Transfer is a process of transfering the toner image (visible image) formed on the drum surface onto the paper.

An electric charge applied by the high voltage power supply flows to the transfer belt from the power supply roller. Then it flows to the paper and photo conductor. The toner, which has been developed on the photo conductor, is transfered to this paper with an electric charge.

Separation:

The paper is absorbed to the belt and separated from the drum by the electrostatic attraction acting between the belt (plus charge) and the polarization charge (minus charge) on the bottom surface of the paper.

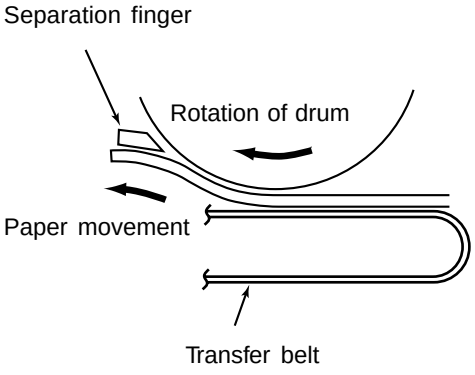




Reference

- Combined use of transfer belt and separation finger

  To prevent the copy paper from failing to be separated during the operation, due to incomplete transfer belt charging or absorption of moisture, and thus jamming up the cleaner, a separation finger mechanically separates any copy paper which fails to be separated.



(7) Fusing

Fusing is a process of melting and fixing the toner on the paper.

Method : The melting point of the toner (main ingredient: resin) is 100~110°C.

↓

(Heat) The toner is melted by the heat of the surface of the fuser roller.

+

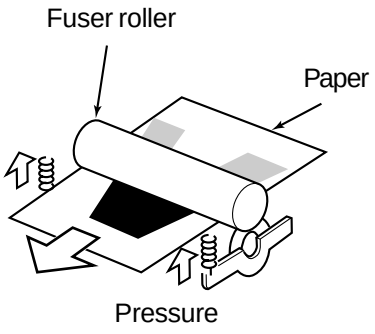
(Pressure) The pressure roller is pressed against the fuser roller by the springs to increase adherence of the melted toner to the paper.

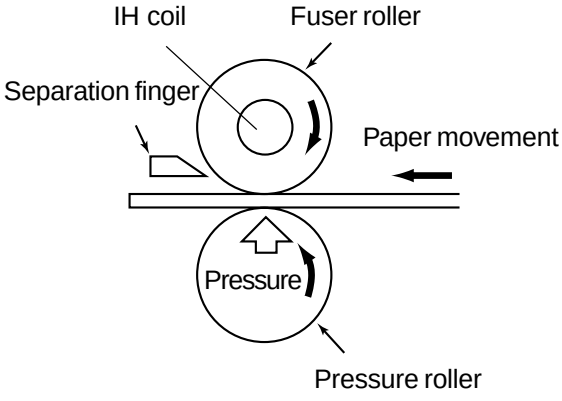
↓

Heat and pressure are applied to the paper when it passes between the fuser roller and pressure roller.

||

(Fusing) The toner is fixed on the paper.





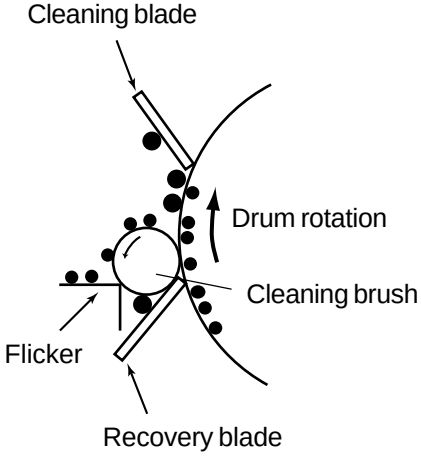
(8) Cleaning

Cleaning is a process of recovering the residual toner on the photoconductive drum.

1. The cleaning brush scrapes off the excessive toner and paper wastes. The flicker scrapes off the toner on the brush.
   Also, too pervent the cleaning blade from scratching the surface of the drum to make a circumferential streak, the varistor is attached between the brush and earth.

2. Cleaning blade scrapes off the residual toner on the drum.

3. The recovery blade picks up the scraped toner.



(9) Discharging

Discharging is a process of eliminating the (–) charge remaining on the photoconductive drum before the next charging process begins.

If discharging does not occur, the following phenomenon will occur:

The (–) charge remains on the photoconductive drum.

↓

Uneven charge is applied to the drum during the next copy.

↓

The next copy has a double image. (Preceding image appears.)

Solution :

Expose the entire surface of the photoconductive drum to the light by the discharge LED array.

↓

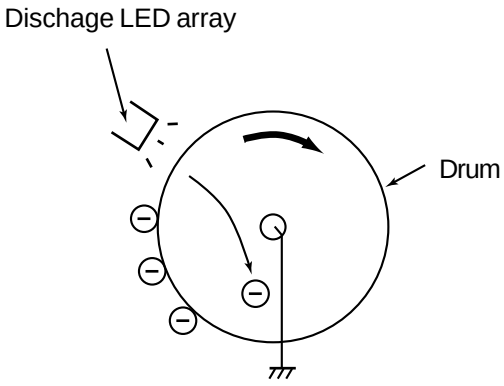
The photoconductive drum becomes electrically conductive.

↓

All the (–) charges remaining on the photoconductive drum are conducted to the ground.

↓

The preparation for the next copy is completed.



3. 3. Comparison of Copy Process to 6570/5570

Process	6570/5570	e-STUDIO550/650/810
1. Photoconductive drum	OD-6570 (OPC drum)	OD-6510 (OPC drum)
(1) Sensitivity	Highly sensitized drum	Same as 6570/5570
(2) Surface potential	–650 V (grid voltage –720V)	–700 V (grid voltage –733V)
2. Charging	Scolotron method (constant current)	Same as 6570/5570
	Grid output variable	Same as 6570/5570
3. Surface potential controlling	None	Surface potential sensor
4. Writing		
(1) Light source	Semiconductor laser (adjustment not required)	Same as 6570/5570
(2) Light amount	4.0 nJ/mm^2	3.8nJ/mm^2
5. Image density control	Image quality sensor	Same as 6570/5570
6. Development		
(1) Magnetic roller	Two magnetic rollers	Same as 6570/5570
(2) Auto-toner	Magnetic bridge-circuit method	Same as 6570/5570
(3) Toner supply	Toner hopper system	Toner cartridge system (There is a toner recycle system.)
(4) Toner-empty detection	Density detection method/lever joint use	Density detection system
(5) Toner	T-6570/6570E	T-6510/6510E/6510D
(6) Developer material	D-6570J	D-6510
(7) Developer bias	DC-400V + AC	DC-500V + AC
7. Transfer		
(1) Transfer	Transfer belt	Transfer belt (Electrical resistance is lower than 6570/5570.)
(2) Power supply roller	Power supply roller	Power supply roller
Separation auxiliary roller	Separation auxiliary roller	
8. Separation	Transfer belt charging	Same as 6570/5570
	Separation finger applied	Same as 6570/5570
9. Discharging		
(1) Discharging position	Discharge by exposure after cleaning	Same as 6570/5570
(2) Discharge lamp	Discharge by red LED	Same as 6570/5570
(3) Pre-cleaning discharge	None	Same as 6570/5570
10. Cleaning		
(1) System	Blade + Brush	Same as 6570/5570
(2) Recovered toner	Not acceptable	Reuse (by the toner recycle system)
11. Cleaning brush bias	Earth	Varistor 430V

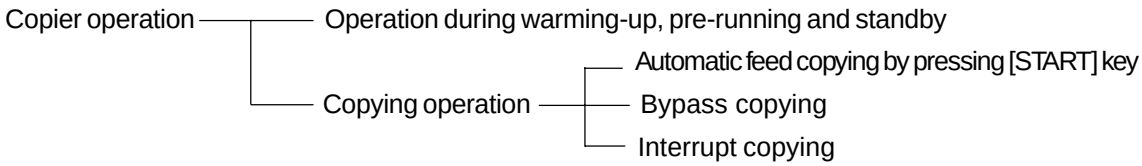
Process	6570/5570	e-STUDIO550/650/810
12. Fusing		
(1) System	Long-life heat roller system	Same as 6570/5570
	· Fuser roller: Fluoroplastic-coated roller (ø60) · Pressure roller: PFA tube roller (ø60)	· Fuser roller: Fluoroplastic-coated roller (ø60) · Pressure roller: PFA tube roller (ø60)
(2) Cleaning	· Fuser roller cleaning roller (ø33)	· Cleaning web (for fuser roller cleaning)
	· Cleaning felt roller (ø27)	
	· Pressure roller cleaning felt roller (ø28)	· Pressure roller cleaning felt roller
	· Cleaning metal roller	· Pressure roller cleaning metal roller
(3) Heater	Halogen lamp (Lamp system)	IH coil (Induction heating system)
	(Lamp rating: 800W + 300W)	
	ON/OFF control by thermistor	Same as 6570/5570

4. GENERAL OPERATION

4. 1. Overview of Operation
4. 2. Operation
4. 2. 1. Warming-up
4. 2. 2. Standby state (ready for copying)
4. 2. 3. Cassette feed copying with [START] key ON
4. 2. 4. Bypass copying
4. 2. 5. Interrupt copying
4. 3. Abnormality Detection
4. 3. 1. Abnormality classification
4. 3. 2. Abnormality description
4. 4. Flow Chart
4. 4. 1. Power ON to ready
4. 4. 2. Automatic feed copying

4. GENERAL OPERATION

4. 1. Overview of Operation



4. 2. Operation

4. 2. 1. Warming-up

(1) Initialization

- Power turned ON
- IH coil turned ON
- Set number "1" and "WAIT WARMING UP" displayed
- Fan motors turned ON
- Scanning section initialization
  ~ Carriage moving to home position and stopping there
  ~ Carriage moving to peak detection position
  ~ Exposure lamp turned ON ~ Peak detection (White color is detected by the shading correction plate.)
  ~ Exposure lamp turned OFF
  ~ Carriage moving to home position
- Feed unit initialization
  ~ Each cassette tray going up
- Writng section initialization
  ~ Polygonal motor rotating
  ~ Beam position controlled
- Other
  ~ Main charger cleaner operating

(2) Pre-running operation

Pre-running operation is started when the temperature of the fuser roller reaches a certain temperature. (Pre-running is not carried out when the fuser roller has been already hot enough.)

- Fuser roller rotating
- Drum rotating
  ~ Drum motor, used toner transport motor turned ON
- Image quality control
  ~ Patch formed on drum and its reflective ratio read out to set an optimal condition.

(3) When fuser roller temperature becomes sufficient for fusing:

- IH coil turned OFF
- Set number "1" and "READY" displayed

4. 2. 2. Standby state (ready for copying)

- Keys on control panel enabled
- When no key is pressed for a certain period of time:
  ~ Set number “1” and reproduction ratio “100%” displayed and copier returning to normal standby state

4. 2. 3. Cassette feed copying with [START] key ON

(1) [START] key ON
- “READY” display changed to “COPYING”
- Main charger, developer bias and discharge lamp turned ON/Each fan rotating at a high speed
- Drum, transfer belt, fuser unit and developer unit rotating

(2) Cassette paper feeding
- Feed motor and feed clutch turned ON
  ~ Pickup roller, feed roller and transport roller rotating
- Paper reaching transport roller
  ~ Cassette transport sensor turned ON
- Feed clutch turned OFF after a certain period of time
- Paper reaching registration roller
  ~ Registration sensor turned ON and aligning performed
- Feed motor stopping after a certain period of time

(3) Carriage operation
- Exposure lamp turned ON → White shading compensation is carried out.
- Scanning motor turned ON → Carriages 1 and 2 start to advance.
- Copier entering toner supply operation with developer material toner density being lower than pre-set value

(4) In a certain time after carriage operation:
- Registration motor turned ON → Paper is sent to the transfer section.
- Copies counted

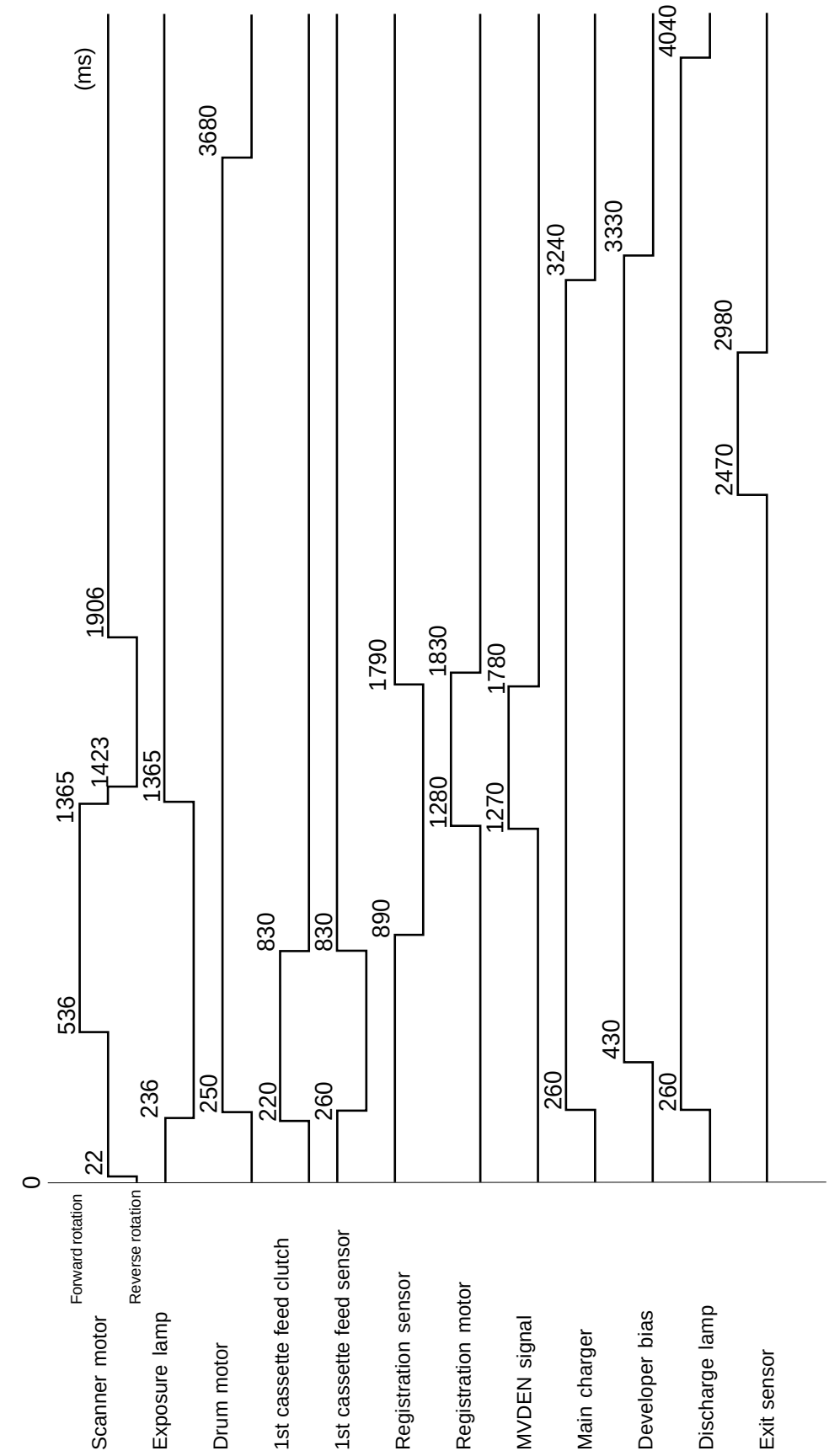
(5) In a certain time after registration motor is turned ON:
- Transfer charger ON

(6) Carriage scanning termination
- Scanning motor turned OFF
- Exposure lamp turned OFF
- Registration motor turned OFF (after paper trailing edge has passed registration sensor)

(7) Paper discharging

- Exit sensor detecting passing of paper trailing edge
- Main charger, developer bias and discharge lamp turned OFF
- Each operation of drum, transfer belt, fuser unit and developer unit stopping and each fan returning to standby mode rotation
- “READY” displayed and copier entering standby mode

Timing chart for copying one A4 sized sheet fed from the 1st cassette



4. 2. 4. Bypass copying

(1) Paper inserted into bypass feed tray.
- SFB feed sensor turned ON
  ~ "READY FOR BYPASS FEEDING" displayed

(2) [START] key pressed
- "READY FOR BYPASS FEEDING" display changed to "COPYING"
- Main charger, developer bias and discharge lamp turned ON/Each fan rotating at a high speed
- Drum, developer unit, transfer belt, and fuser roller rotating

(3) Sheet-bypass feeding
- Bypass pickup solenoid turned ON and feed motor rotating in reverse
  ~ Bypass pickup roller lowered
- Bypass feed clutch turned ON
  ~ Bypass feed roller, paper feed roller, and separation roller rotating
- Aligning operation
- Paper reaching registration roller
- Bypass pickup solenoid, feed motor and bypass feed clutch turned OFF in a certain period of time later

(4) Same operations as (3) through (6) of cassette feed copying with [START] key ON carried out

4. 2. 5. Interrupt copying

(1) [INTERRUPT] key pressed
- Interruption lamp turned ON
- Copying operation temporarily halted and carriages-1 and -2 returning to their home position
- "JOB INTERRUPTED JOB 1 SAVED" displayed
- Copying mode set to automatic density and 1-to-1 reproduction ratio and copy quantity indicator unchanged

(2) Preferred copying modes specified

(3) After an interrupt copying is terminated:
- "PRESS INTERRUPT TO RESUME JOB 1" displayed
- Interruption lamp turned OFF/Copier returning to conditions before interruption when [INTERRUPT] key is pressed again
- "READY TO RESUME JOB 1" displayed

(4) [START] key pressed
- Back to copying operation before interruption

4. 3. Abnormality Detection

When an abnormality occurs in the copier, a symbol corresponding to the type of the abnormality is displayed to draw the operater's attention.

4. 3. 1. Abnormality classification

A) Abnormalities which can be cleared without resetting the door switch
   (1) Add paper
   (2) Paper misfeed in bypass
   (3) Set key copy counter

B) Abnormalities which cannot be cleared without resetting the door switch.
   (1) Misfeed in copier
   (2) Developer unit not installed properly
   (3) Add toner

C) Abnormalities which cannot be cleared without turning OFF the main switch
   (1) Call for service

4. 3. 2. Abnormality description

A-1) Add paper

Empty sensor detects the presence or absence of paper.

[When cassette is not installed]

No Cassette detected

↓

Tray not going up (empty sensor OFF)

↓

"Add paper" displayed

↓

[START] key disabled

[When cassette is installed]

Cassette detected

↓

Tray going up (empty sensor OFF)

↓

"Add paper" displayed

↓

[START] key disabled

- When power is turned ON or feed unit initializing is operated:

  ↓

  Presence or absence of paper detected

  Tray motor ON ~ Tray going up

  → When tray-up sensor is not turned ON within a certain period of time:

  Tray being abnormal → "Add paper" displayed regardless of paper being present or not

  ↕

  Turn ON and OFF the power to clear this condition.

  → When tray-up sensor is turned ON within a certain period of time:

  ~ Tray motor stopping

  At this time,
  - if empty sensor is ON ~ Determined there is a paper
  - if empty sensor is OFF ~ Determined there is no paper

  ↓

  "Add paper" display blinked

- When the remaining sheets of paper are getting short during copying:

  → Tray-up sensor turned OFF → Tray-up motor turned ON ~ Tray going up

  → Tray-up sensor turned ON → Tray motor stopping

- When empty sensor is turned OFF despite tray-up sensor being ON during copying:

  ↓

  Determined there is no paper

  ↓

  "Add paper" display blinked

  ↓

  Copying stopped

A-2) Bypass misfeed (8)

- When doing a bypass feeding:

  Bypass feed pickup solenoid turned ON

  ↓

  Registration sensor turned ON

  * When the registration sensor is not turned ON after a certain period of time (E12):

  ↓

  Bypass misfeeding

  ↓

  “Clear paper” symbol (8) displayed

  ↓

  Copying operation disabled

  Solution: Remove paper from the bypass tray, and the bypass sensor will be turned OFF.

A-3) Set key copy counter

- When the key copy counter (optional) is pulled out from the copier which installs it:

  “Set key copy counter” displayed

  ↓

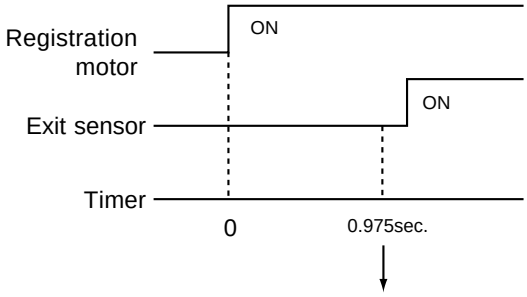
  Copying operation disabled

- When the counter is pulled out during copying:

  Copying is stopped when the key copy counter is pulled out.

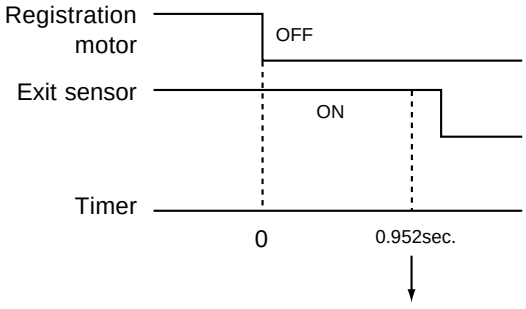
B-1) Misfeed in copier ( )

- Paper leading edge jam detected by exit sensor
  Registration motor turned ON
  ↓
  Exit sensor not turned ON within 0.975 sec.
  ↓
  "Clear paper" symbol ( ) displayed (E01)
  ↓
  Copying stopped



Misfeed in copier (E01)

- Paper trailing edge jam deteced by exit sensor
  Registration motor OFF
  ↓
  Exit sensor not turned OFF within 0.952 sec.
  ↓
  "Clear paper" symbol ( ) displayed (E02)
  ↓
  Copying stopped



Misfeed in copier (E02)

- Immediately after power is turned ON:
  ↓
  Any of all sensors at transport path detecting paper (ON)
  ↓
  "Clear paper" symbol ( ) displayed (E03)

- Front cover opened during copying
  ↓
  "Clear paper" symbol ( ) displayed (E41)

- Paper leading edge jam detected by registration sensor
  Registration sensor not turned ON within a certain period of time after paper leading edge has passed transport roller
  ↓
  "Clear paper" symbol ( ) displayed (E20, 22, 25, 30, 34, 3C)

- When a sheet of paper is fed at reverse section:
  Registration sensor not turned ON within a certain period of time after reverse motor has been turned ON
  ↓
  "Clear paper" symbol ( ) displayed (E11)

- When a sheet of reversed paper is transported:
  Transport sensor 1 not detecting paper in a certain timing
  ↓
  "Clear paper" symbol ( ) displayed (E51, 52, 53, 54)

- When a sheet of paper is fed:
  Feed sensor not turned ON after feed clutch has been turned ON
  ↓
  "Clear paper" ( ) symbol displayed (E13, 14, 15, 16, 18, 19: Error codes change depending on the cassette used.)

B-2) Add toner ( )
Toner density lowered
↓
Toner empty detected: Auto toner sensor
↓
Control circuit → "Replace toner cartridge" symbol ( ) displayed: Copying cannot be started.
Solution: Open the front cover and replace the toner cartridge.
Toner supply operation: copying can be started.

B-3) Replace toner bag ( )
Toner bag becoming full with used toner
↓
Used toner transport auger moving to feed side: Toner bag full detection sensor ON
↓
"Replace toner bag" symbol ( ) displayed

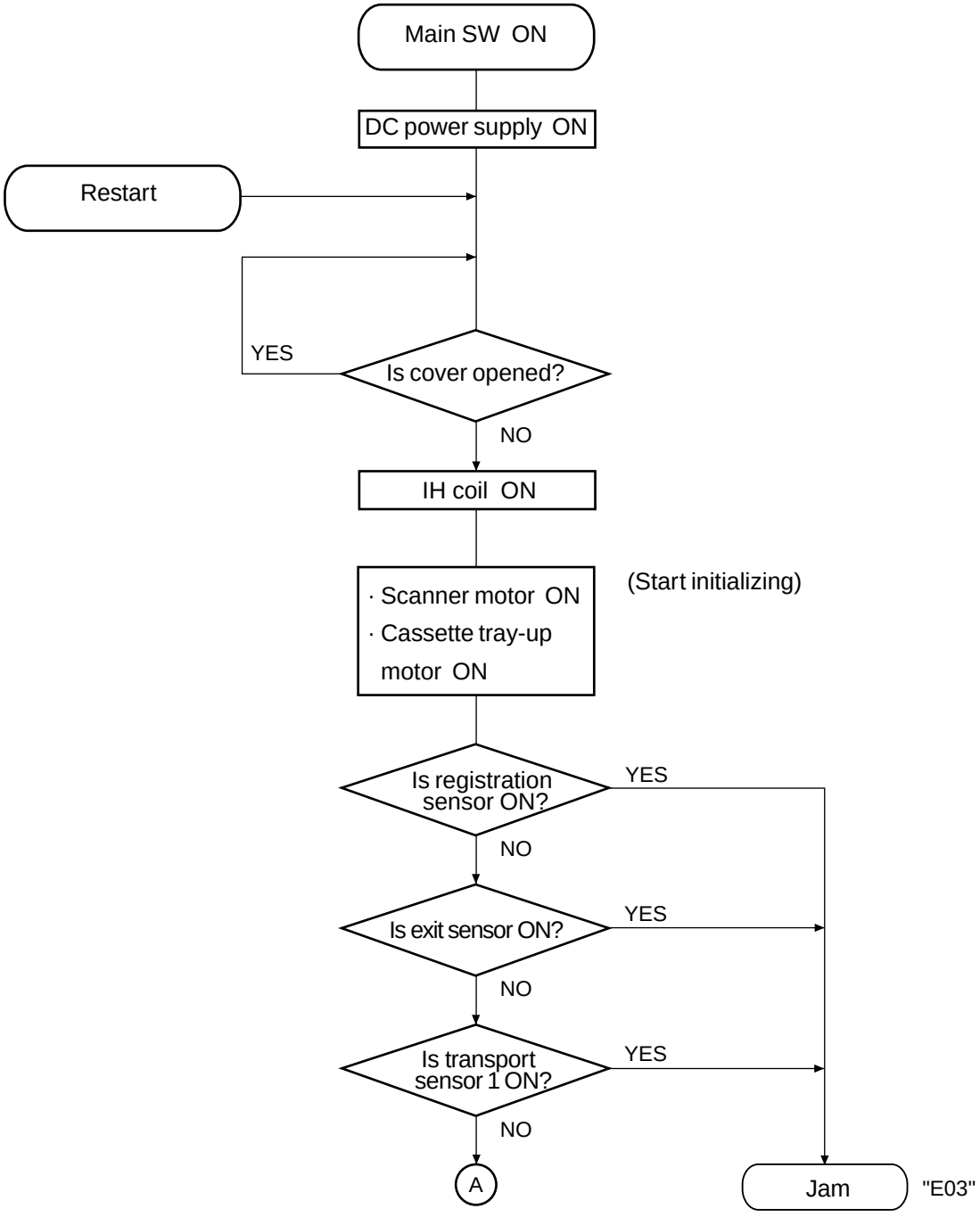
- Toner bag full detection sensor turned ON during copying
  ↓
  Copying stopped after the last sheet copied has been discharged
  Solution: Replace to a new toner bag by a service technician.

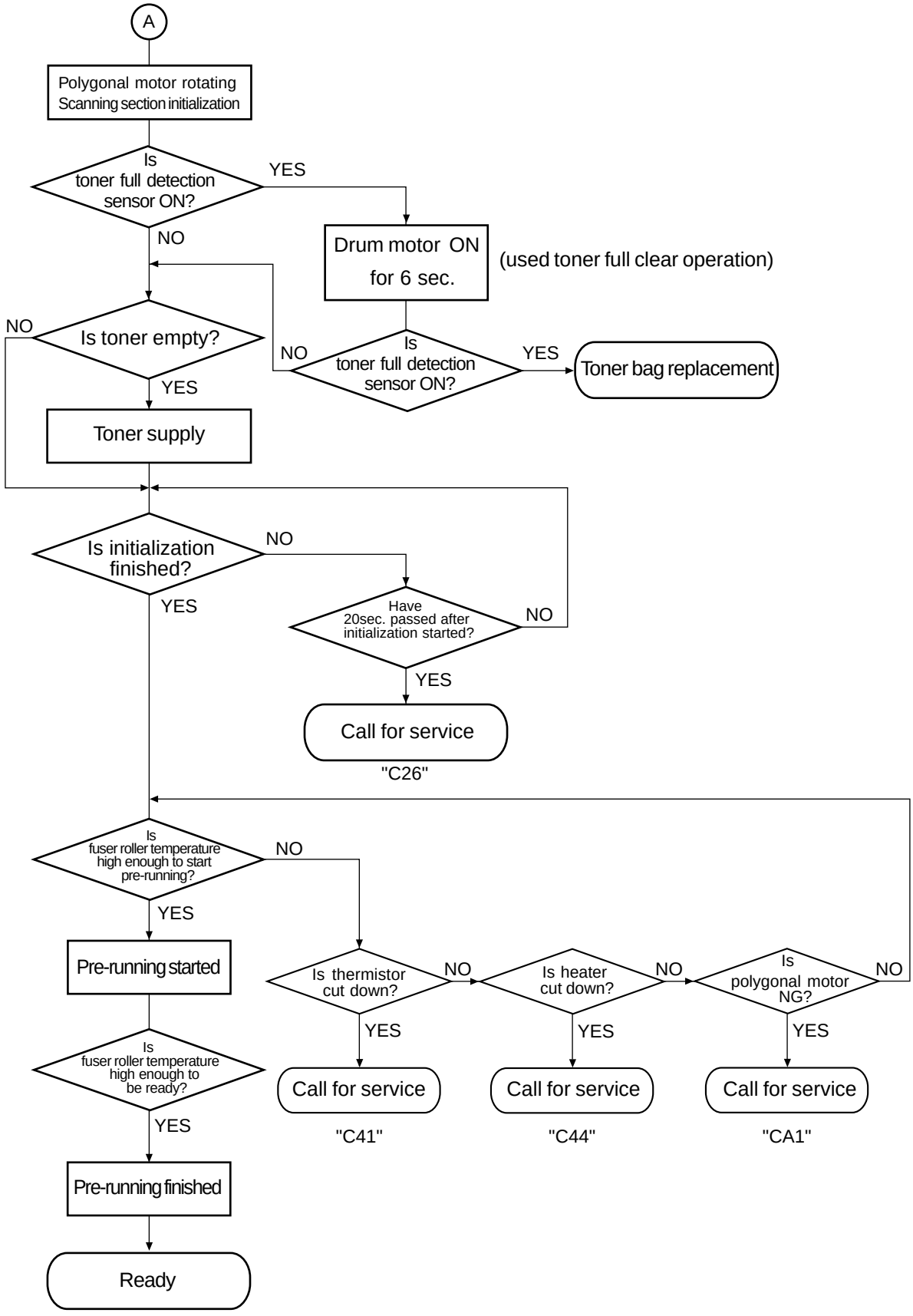
B-4) Developer unit not installed properly
Developer unit desconnected
↓
"Developer unit not installed properly" displayed
Solution: Connect the developer unit connector and close the front cover.

C-1) Call for service
When the [CLEAR] and "8" keys are pressed simultaneously when the "Call for service" symbol is blinking, an error code appears on the message display.
For the contents of the error codes, refer to the "SERVICE HANDBOOK".

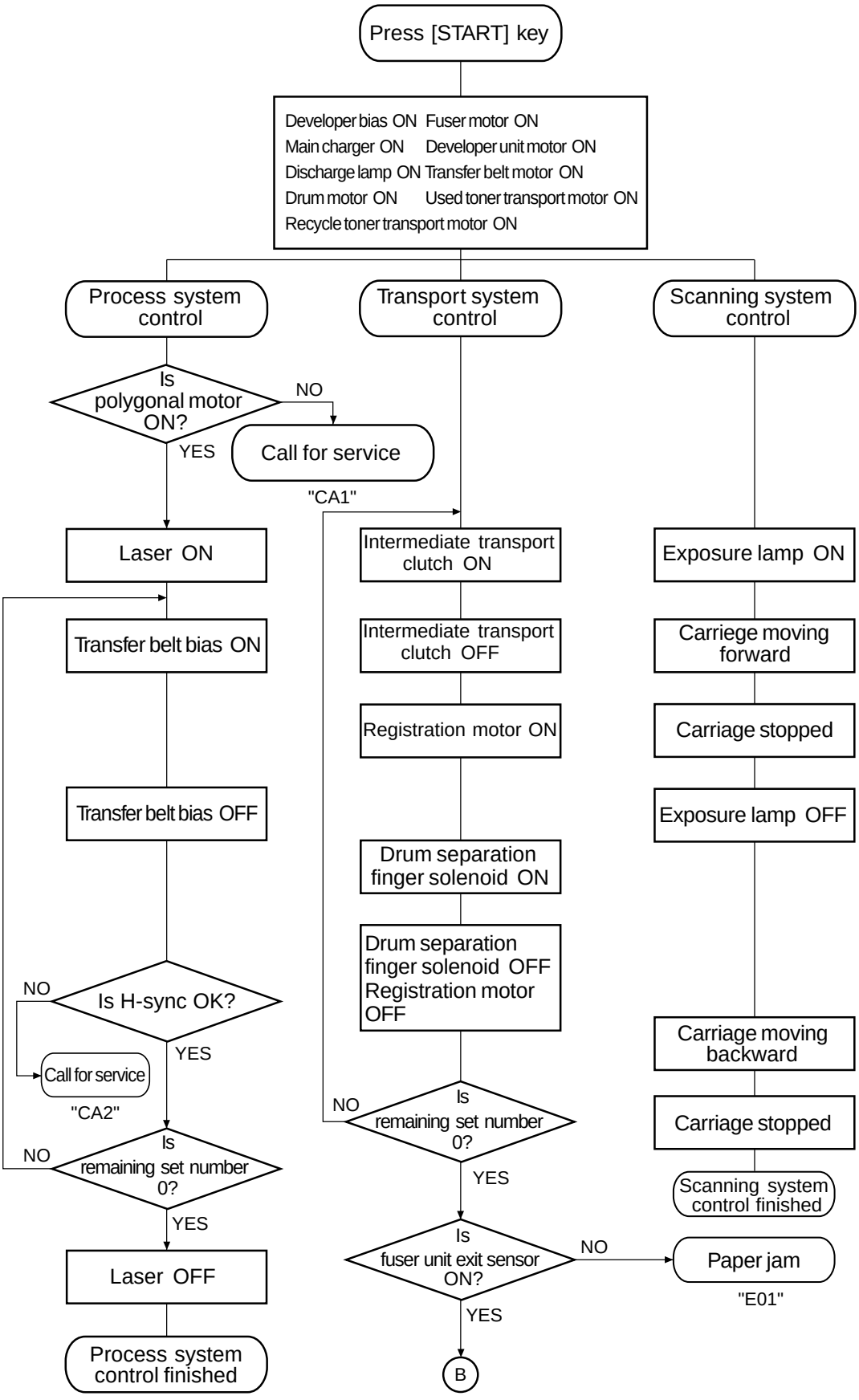
4. 4. Flowchart

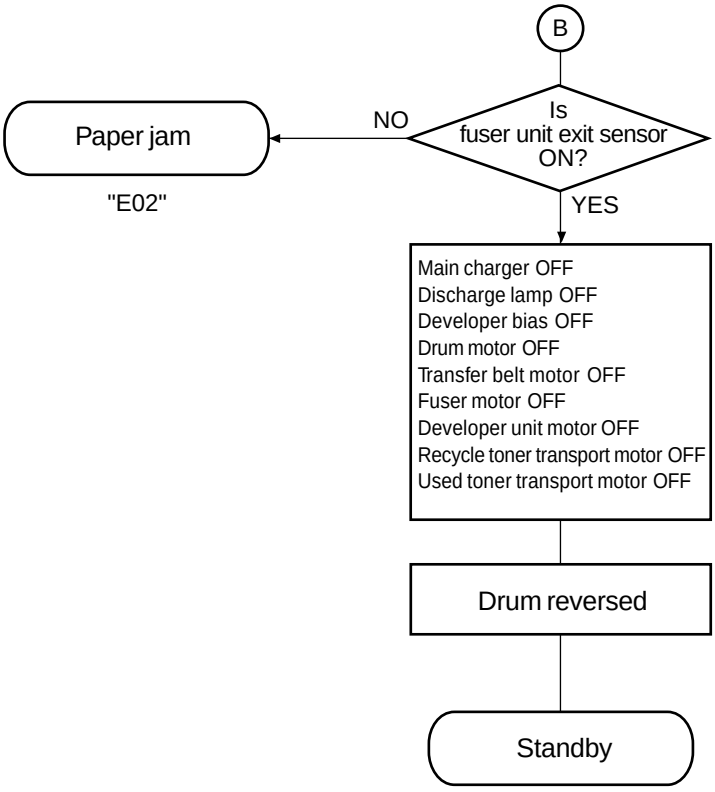
4. 4. 1. Power ON to ready




A
Polygonal motor rotating
Scanning section initialization
Is
toner full detection
sensor ON?
YES
NO
Drum motor ON
for 6 sec.
(used toner full clear operation)
NO
Is toner empty?
YES
Toner supply
NO
Is
toner full detection
sensor ON?
YES
Toner bag replacement
Is initialization
finished?
NO
YES
Have
20sec. passed after
initialization started?
NO
YES
Call for service
"C26"
Is
fuser roller temperature
high enough to start
pre-running?
NO
YES
Pre-running started
Is thermistor
cut down?
NO
YES
Call for service
"C41"
Is heater
cut down?
NO
YES
Call for service
"C44"
Is
polygonal motor
NG?
NO
YES
Call for service
"CA1"
Is
fuser roller temperature
high enough to
be ready?
YES
Pre-running finished
Ready

4. 4. 2. Automatic feed copying




B
Is
fuser unit exit sensor
ON?
NO
Paper jam
"E02"
YES
Main charger OFF
Discharge lamp OFF
Developer bias OFF
Drum motor OFF
Transfer belt motor OFF
Fuser motor OFF
Developer unit motor OFF
Recycle toner transport motor OFF
Used toner transport motor OFF
Drum reversed
Standby

5. CONTROL PANEL

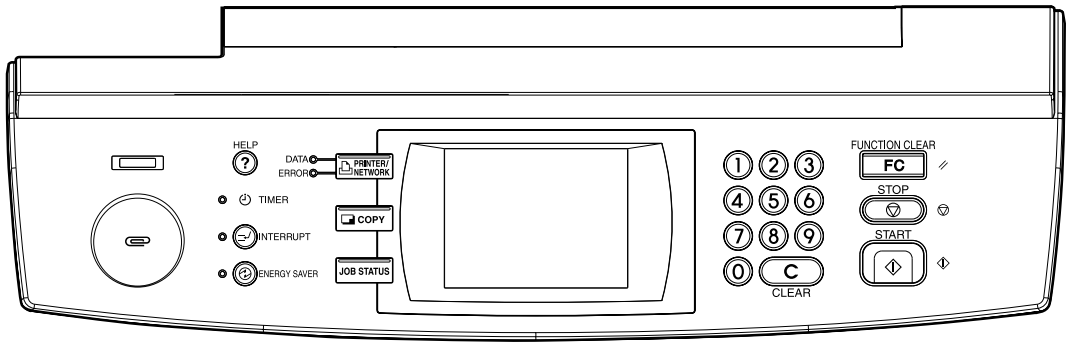
5. 1. Control Panel and Display Panel
5. 2. Items Shown on Display Panel
5. 2. 1. Display during normal copying
5. 2. 2. Display in abnormal condition
5. 3. Relation between Copier State and Operator's Action
5. 4. Operation
5. 4. 1. Dot matrix LCD circuit
5. 4. 2. LED display circuit
5. 5. Disassembly and Replacement

5. CONTROL PANEL

5. 1. Control Panel and Display Panel

The display unit consists of key switches and touch-panel switches to operate the copier and select various modes, and LEDs and an LCD to display the state of the copier or the messages.

When the operator's attention is reguired, graphic symbols appear with messages explaining the condition of the copier in the LCD panel.



Control Panel Exterior View

5. 2. Items Shown on Display Panel

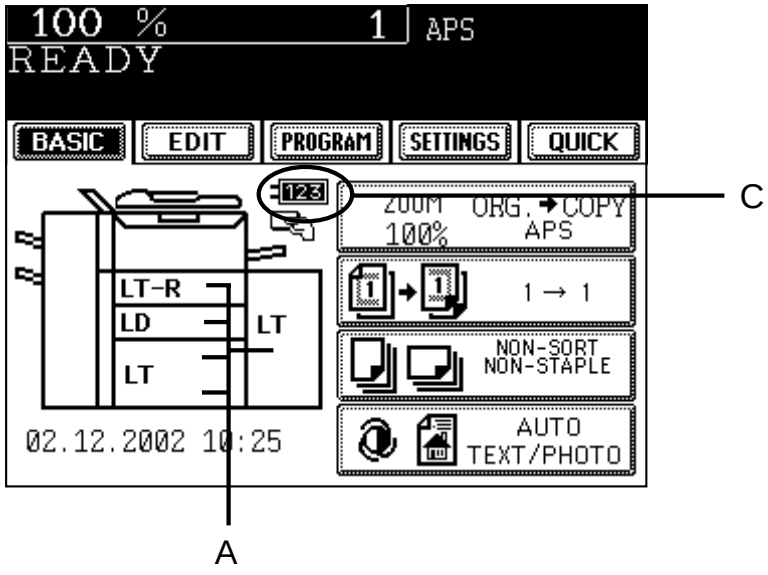


Fig. 5.2-1

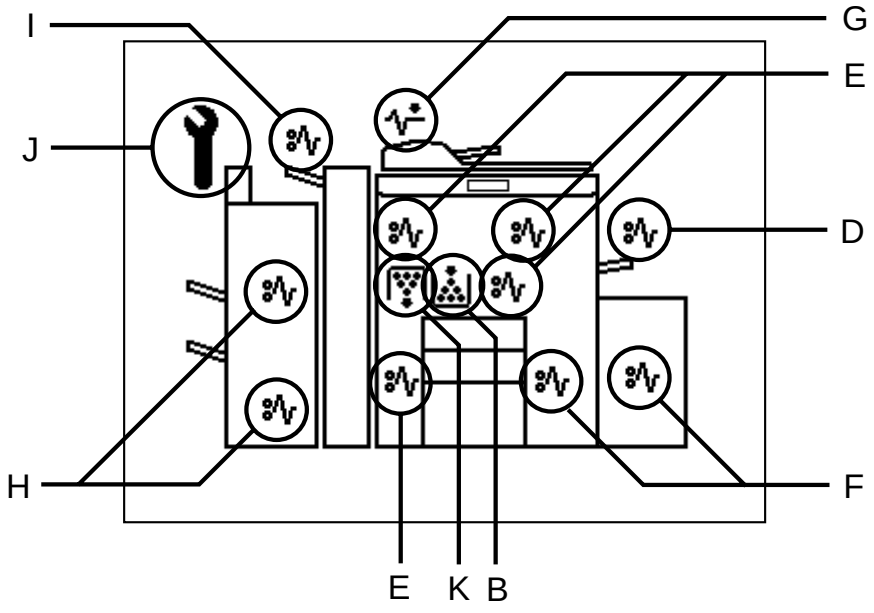


Fig. 5.2-2

5. 2. 1. Display during normal copying

No.	Message	State of copier	Note
1	WAIT WARMING UP	Scanner warming up - Displayed when the power is turned ON until the copier becomes ready to start scanning.	- The set number “1” and the reproduction ratio “100%” are displayed when the power is turned ON.
2	READY(WARMING UP)	Ready for scanning - The copier is ready for scanning and waiting for operator to select the copying conditions. - Returns to default setting if no key is operated within 45 seconds.	- The set number “1” is displayed. Press the digital key to change the number. - The number is reset to “1” by pressing the [CLEAR] key. - Bypass feed copying is enabled.
3	READY	Ready for copying - The copier is ready for copying and waiting for the operator to select the copying conditions. - Returns to default setting if no key is operated within 45 seconds.	- The set number “1” is displayed. Press the digital key to change the number. - The number is reset to “1” by pressing the [CLEAR] key. - Bypass feed copying is enabled.
4	COPYING	The original is being scanned - Displayed by pressing the [START] key.	- After scanning is completed, the copier becomes ready for the next scanning.
5	Saving energy - Press [START]	The copier is in the energy saver mode.	- Can be cleared by pressing the [START] key, function select key.
6	Place next original Press [START] to copy	Ready for the next original - Displayed by pressing the [Next original; YES] key.	- Displayed for SADF and manually placed originals.
7	—	Power is OFF - Nothing is displayed in the display panel. - Timer LED is lit.	- Press the [START] key or function select key.
8	READY (PRINTING)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. Background printing is in progress.	- Since background printing is in progress, the scanned image is not output immediately.
9	READY (ADD PAPER)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. Paper in the cassette has run out during printing.	- Printing is resumed by adding paper to the cassette.
10	READY (FINISHER FULL)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. The finisher is full of paper.	- Printing is resumed by removing paper from the finisher.
11	READY (HOLE PUNCH DUST FULL)	Ready for scanning - The copier is ready for scanning and waiting for operator to select the copying conditions. The punching dust box is full.	- Printing is resumed by removing punching dust from the dust box.

No.	Message	State of copier	Note
12	READY (SADDLE STITCH TRAY FULL)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. The saddle stitcher is full of paper.	Printing is resumed by removing paper from the saddle stitcher unit.
13	READY (SET CORRECT CASSETTE)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. Cassette not installed during printing	- Printing is resumed by changing the setting for cassette selection, then pressing the [START] key.
14	READY (ADDING TONER)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. The receiving tray is full of paper.	- Printing is resumed automatically when the toner supply is completed.
15	READY (CHECK STAPLER)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. The finisher unit runs out of the staples.	- Printing is resumed automatically when the staple cartridge is replaced with a new one.
16	READY (CHECK SADDLE STITCH STAPLER)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. The saddle stitcher unit runs out of the staples.	- Printing is resumed automatically when the staple cartridge is replaced with a new one.
17	READY (USE GENUINE TOSHIBA TONER)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. Toner other than Toshiba's has been used.	The display is made to disappear by using the toner provided by Toshiba.
18	ENTER DEPART-MENT CODE	The copier is waiting for the operator to enter the department code. - Displayed when the department management function has been used	The copier becomes ready to start copying when the correct department code is entered.
19	READY (ADD INSERTER PAPER)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. No inserter paper	Printing is resumed when the [START] key is pressed under the condition the printing UI is displayed ([JOB STATUS] key pressed) after adding inserter paper.
20	READY (ADD TAB SHEET)	Ready for scanning - The copier is ready for scanning and waiting for the operator to select the copying conditions. No tab paper	Printing is resumed when the [START] key is pressed under the condition the printing UI is displayed ([JOB STATUS] key pressed) after adding tab paper.
21	READY (FINISHER IN USE)	Ready for scanning -The copier is ready for scanning and waiting for the operator to select the copying conditions. Finisher manual operating	Printing is started when pressing the [START] key.

5. 2. 2. Display in abnormal condition

No.	Message	Abnormal state and indication on display panel	Solution
1	Add paper	Paper run out [Fig.5.2-1 A] - The cassette with no more paper flashes.	- Add paper to the cassette. - Select a different cassette.
2	Add toner Press [HELP]	Toner run out [Fig.5.2-2 B] - The toner cartridge is empty. - The message is displayed and the copier is stopped.	- Replace the toner cartridge and close the front door.
3	Set key copy counter	Key copy counter not installed [Fig.5.2-1 C] - The key copy counter was pulled out when copier was ready for scanning. - The copier is stopped when the key copy counter is pulled out after the [START] key was pressed.	- Insert the key copy counter (option).
4	Paper misfeed in bypass	Bypass paper jam [Fig.5.2-2 D] - Paper jam at the bypass tray	- Remove the paper from the bypass tray.
5	Misfeed in copier Press [HELP]	Paper jam in the copier [Fig.5.2-2 E]	- Press the [HELP] key and remove the paper following the messages shown on the display panel.
6	Misfeed in copier Press [HELP]	Misfeeding of cassette paper [Fig.5.2-2 F] - Paper fed from the cassette does not reach the feed sensor in a fixed time.	- Press the [HELP] key and remove the paper following the messages shown on the display panel.
7	Misfeed in doc. feeder Press [HELP]	Original jam [Fig.5.2-2 G] - Original jamming in RADF	- Open the jam-access cover and RADF unit to remove the original.
8	Misfeed in finisher Press [HELP]	Paper jam in the finisher [Fig.5.2-2 H]	- Press the [HELP] key and remove the paper following the messages shown on the display panel.
9	Misfeed in INSERTER	Paper jam in the inserter [Fig.5.2-2 I]	- Press the [HELP] key and remove the paper following the messages shown on the display panel.
10	Call for service	Motors, sensors, switches, etc. do not work properly. [Fig.5.2-2 J]	- Turn OFF the power and solve the problem, then turn ON the power again.
11	Time for periodic maintenance	PM cycle - Time for maintenance - Copying is possible.	- Maintenance and inspection are performed by a qualified service technician.
12	Check paper in LCF	Paper misloading in the tandem LCF - Displayed when a paper is set out of alignment	- Set the paper correctly.
13	—	Toner bag full - The toner bag is full of used toner. The copier stops its operation. [Fig.5.2-2 K]	- Replace the toner bag with a new one and close the front cover.
14	Select the same sized Tab sheets as the originals	Displayed when the paper sizes for the tab sheets and originals are different	- Select the same size for tab sheets and originals.

No.	Message	Abnormal state and indication on display panel	Solution
15	Select the same sized Inserter sheets as the originals	Displayed when the paper sizes for inserter paper and original are different	- Select the same size for the inserter sheets and originals.
16	Set Tab sheets in the same direction as the originals	Displayed when the paper directions for tab paper and original are different	- Set the tab sheets in the same direction as the originals.
17	Set Inserter sheets in the same direction as the originals	Displayed when the paper directions for inserter paper and original are different	- Set the inserter sheets in the same direction as the originals.
18	Only one paper source can be used with Cover Sheet feature.	Displayed when both the cover mode and inserter cover mode are selected	- Release either the cover mode or inserter cover mode.
19	Only two paper sources can be used with Sheet Insertion feature.	Displayed when all the sheet insertion mode, tab insertion mode and inserter sheet insertion mode are selected	- Release any of three modes
20	ADD PAPER TO INSERTER FEEDER	Displayed when the inserter mode is valid and the [START] key is pressed without papers on the tray	- Release the inserter mode - Set papers on the inserter tray
21	Set the paper source for Tab sheet	Displayed when the tab paper mode is valid and the tab cassette is not selected	- Select the 2nd cassette property to the tab to release this state.
22	Cannot use OHP	Displayed when the paper is OHP and duplex printing is carried out	- The display is released when either the setting for OHP or for dupulex printing is released.
23	Wait Saving form	Displayed during inputting the form combination original	- The display is released when the saving has finished.
24	Fuser cleaning web decreased	Displayed when the fuser unit cleaning web gets decreased * This message is set not to be displayed at shipment, but the setting can be changed at the setting mode (08-938).	- Replace the cleaning web.
25	Time for periodic maintenance (Fuser cleaning web)	Displayed when the fuser unit cleaning web gets run out	- Replace the cleaning web.
26	Tab size: A4/LT only	Displayed when the tab paper mode is valid and other than A4/LT is selected for the tab paper size	- Select A4 or LT for tab paper.
27	Please divide and set the documents which is loading over	Displayed when originals on the RADF are loading over	- Remove originals from RADF.
28	Service recommended for SPC	Displayed when the surface potential control error occurs	- The condition is released when the surface potential control has finished normally.

5. 3. Relation between Copier State and Operator's Action

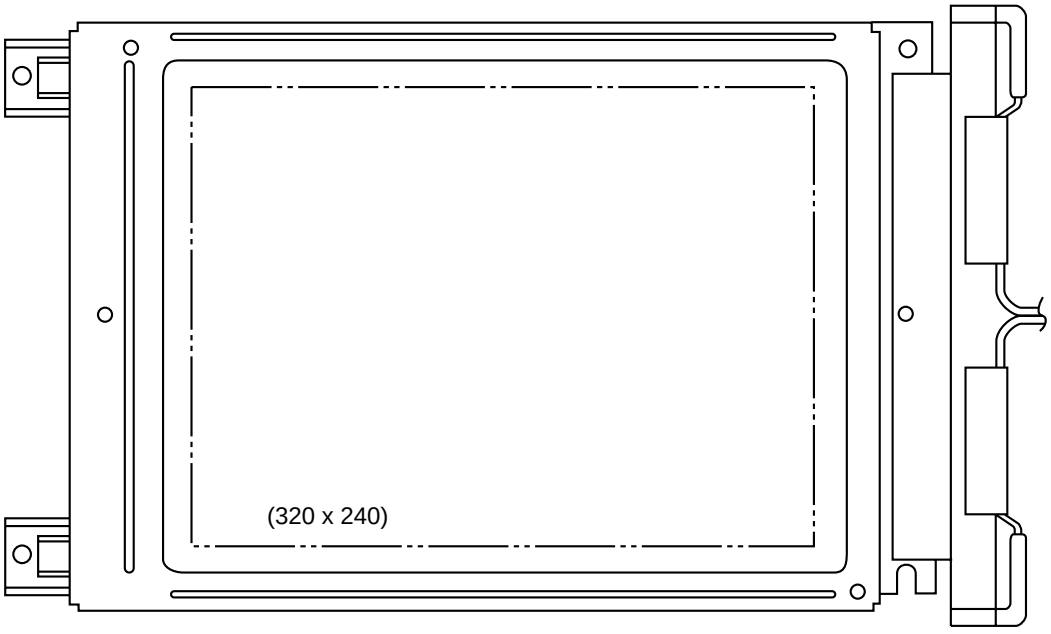
State of copier \ Operation	START key	CLEAR key	Digital keys	Cassette selection	INTERRUPT key	ENERGY SAVER key	Bypass feeding	Touch panel	Function select key	JOB STATUS key	STOP key
Scanner warming up	○	○	○	○	-	-	○	○	-	-	-
Printer warming up	○	○	○	○	○	○	○	○	○	○	-
Ready for copying	○	○	○	○	○	○	○	○	○	○	-
Printing	○	○	○	○	○	○	○	○	○	○	○
Scanning	-	○	-	-	-	-	-	-	-	○	○
Paper run out	○	○	○	○	○	○	○	○	○	○	○
Toner empty	○	○	○	○	○	○	○	○	○	○	○
Key copy counter not inserted (optional)	-	○	○	○	○	○	○	○	○	○	-
Paper misfeed in bypass copying	-	-	-	-	-	-	-	-	-	-	-
Paper jammed inside the machine	-	-	-	-	-	-	-	-	-	-	-
Service call indicated	-	-	-	-	-	-	-	-	-	-	-
Ready for interrupt copying	○	○	○	○	○	-	○	○	-	○	-
In energy saver mode	○	-	-	-	-	○	-	-	○	-	-
Power OFF	○	-	-	-	-	○	-	-	○	-	-
Manual operating	○	○	○	○	-	-	○	○	○	○	-

○ : Operation enabled - : Operation disabled

5. 4. Operation

5. 4. 1. Dot matrix LCD circuit

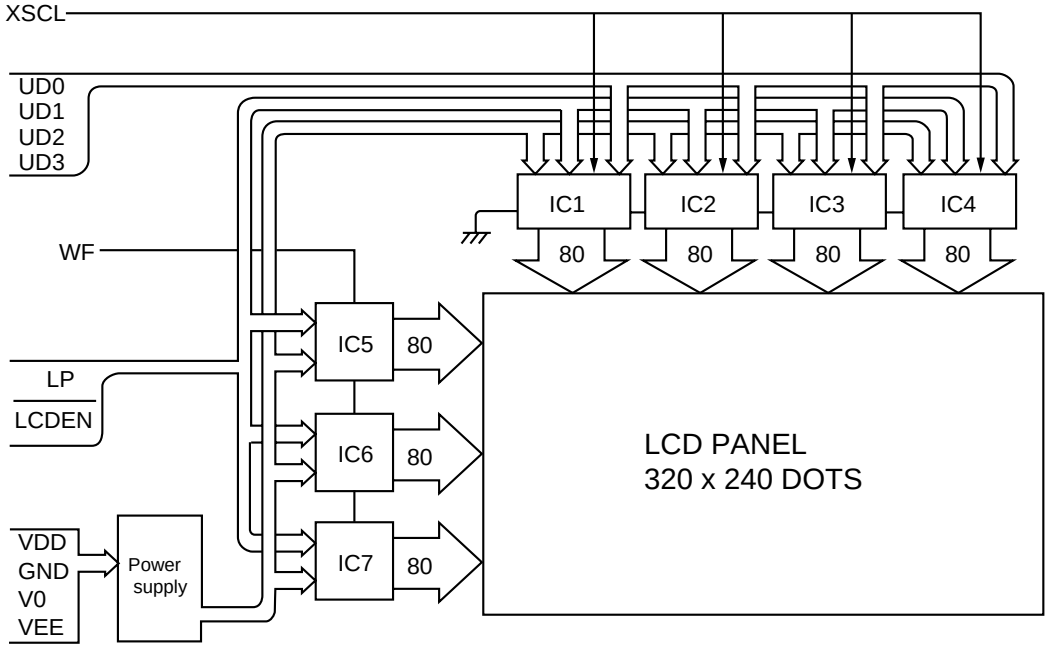
(1) Structure



The DSP-LCD-320 is an STN blue mode transmissive type LCD with a 320 x 240-dot display capacity. It consists of a driver LSI, frame, printed circuit board, and lateral type CFL backlight.

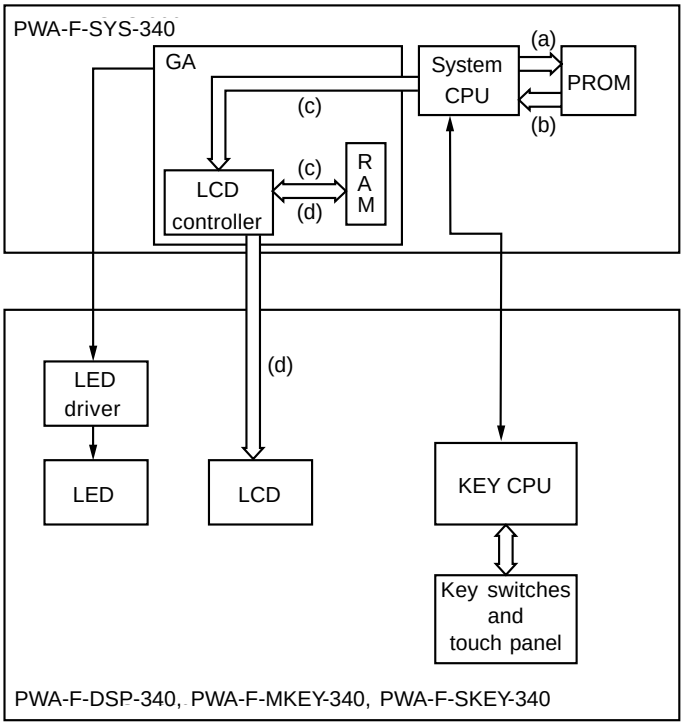
* STN:Super Twisted Nematic

(2) Block diagram



(3) LCD drive operation

The following describes the drive operation to display the message “READY”.



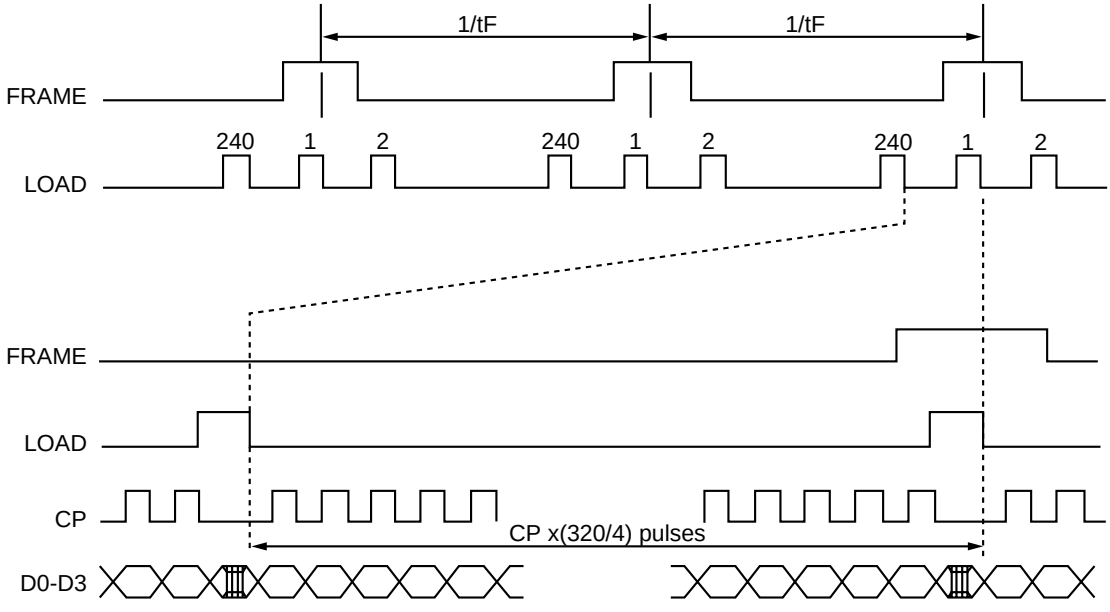
(a) The System CPU requests the PROM data to display “READY”.

(b) The PROM outputs data to display the message to the System CPU.

(c) The System CPU writes the data to be displayed on the LCD into the RAM.

(d) The LCD controller/driver reads the display data from the RAM, and outputs the data to the LCD.

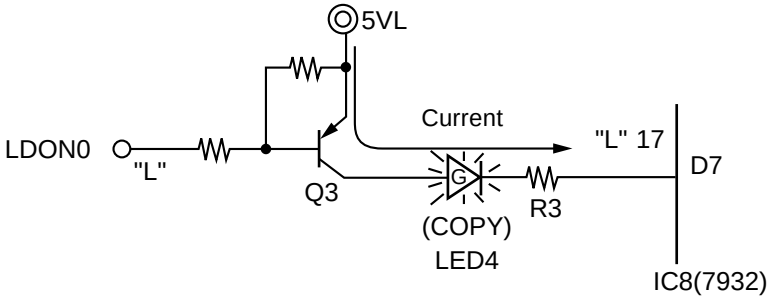
(4) Data transmission



5. 4. 2. LED display circuit

(1) Method of LED display

ex) Displaying “COPY”



The transistor is turned ON when the LDON 0 signal becomes “L” level.

Also, when IC8-17pin (D7) changes to “L”, the current flows from 5VL via the transistor to LED4 (“COPY”) to turn ON LED4 (“COPY”).

Conditions to turn ON the LED

(a) The transistor (Q3) connected to the LED anode is ON.

(b) The output from the cathode side of the LED is “L” level.

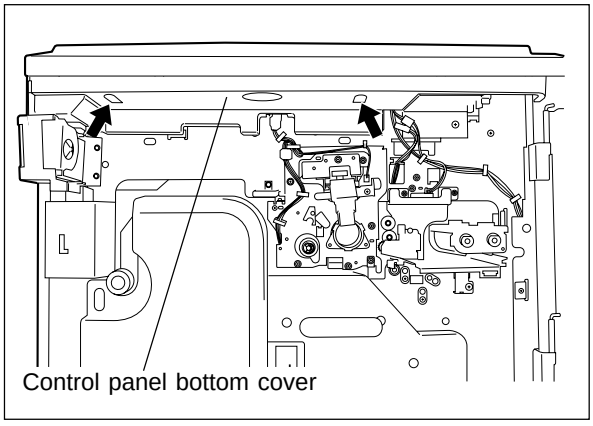
The LED is turned ON when (a) and (b) are satisfied.

5. 5. Disassembly and Replacement

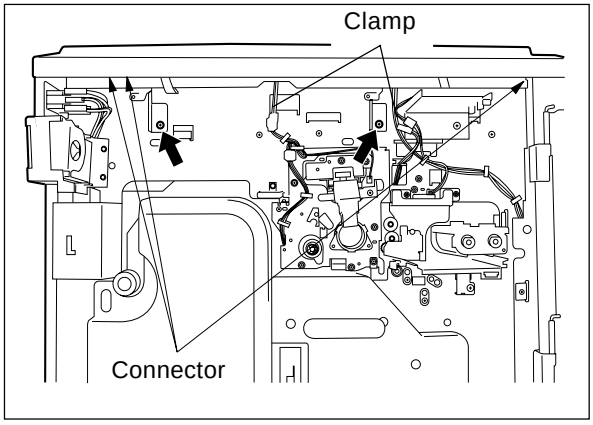
[A] Control panel unit

(1) Open the front cover and take off the front side right inner cover, toner cartridge drive unit and toner recycle unit.

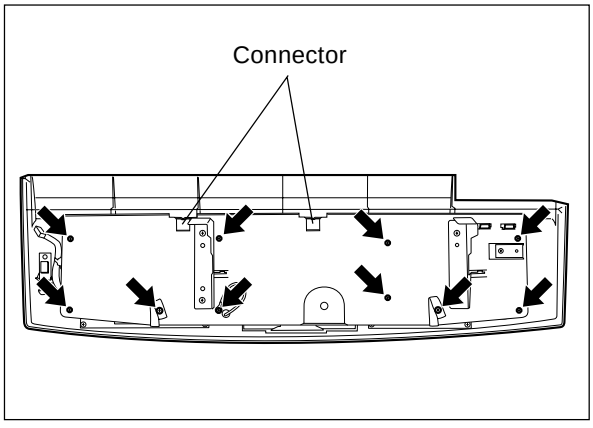
(2) Remove 2 screws and take off the control panel bottom cover.



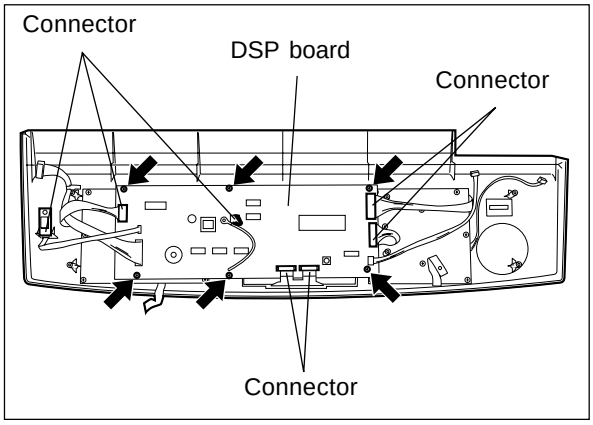
(3) Disconnect 3 connecters, remove 2 screws, release harnesses from 2 clamps and take off the control panel unit.



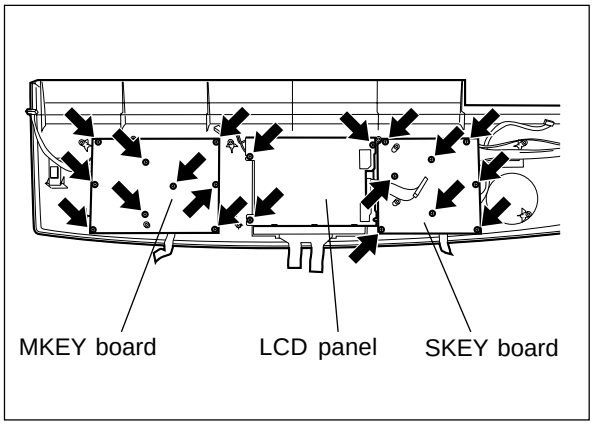
(4) Remove 10 screws, disconnect 2 connectors and release the braket after disconnecting 1 connector at the counter.



(5) Disconnect 7 connectors, remove 6 screws and take off the DSP board.



(6) Remove 9 screws and take off the MKEY board.
(7) Remove 8 screws and take off the SKEY board.
(8) Remove 4 screws and take off the LCD panel.



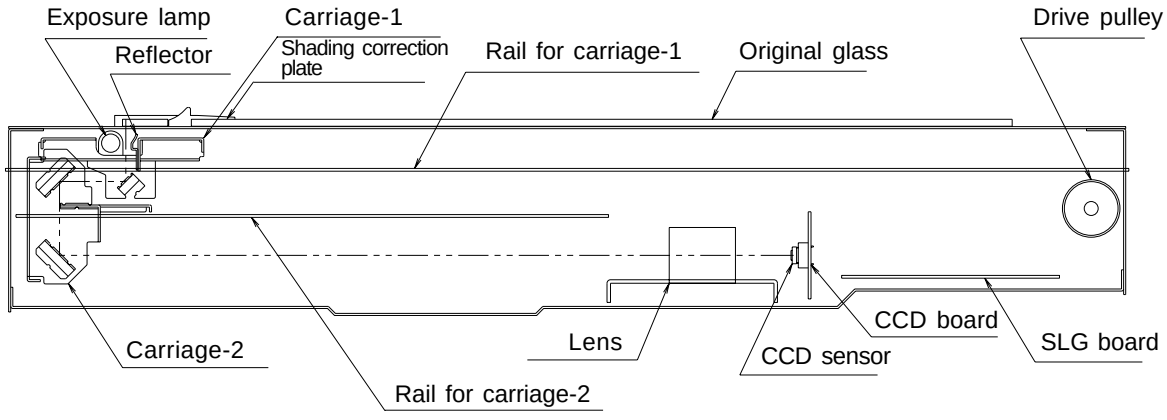
6. SCANNING SECTION

6. 1. Function
6. 2. Construction
6. 3. Operation
6. 3. 1. Scanner motor
6. 3. 2. Two-phase motor drive circuit (fixed-current type)
6. 4. Control for Exposure Lamp
6. 4. 1. General description
6. 4. 2. Exposure lamp
6. 4. 3. Control circuit for exposure lamp
6. 5. CCD control
6. 5. 1. Opto-electronic conversion
6. 5. 2. Shading correction
6. 6. Automatic Original Size Detection Circuit
6. 6. 1. Principle of original size detection
6. 6. 2. Process of original size detection
6. 7. Disassembly and Replacement

6. SCANNING SECTION

6. 1. Function

In the scanning section of this copier, the surface of an original is irradiated with a direct light and the reflected light is led through mirrors and lens to the CCD where the optical-to-electrical conversion is performed, converting the optical image data into an electrical signal. This analog signal is changed to a digital signal, and then undertakes various corrective processes necessary for image formation. After that, an arithmetic operation is performed on the digital signal, which is then sent to the data writing section.



6. 2. Construction

The construction and purpose of the scanning system are described in this section.

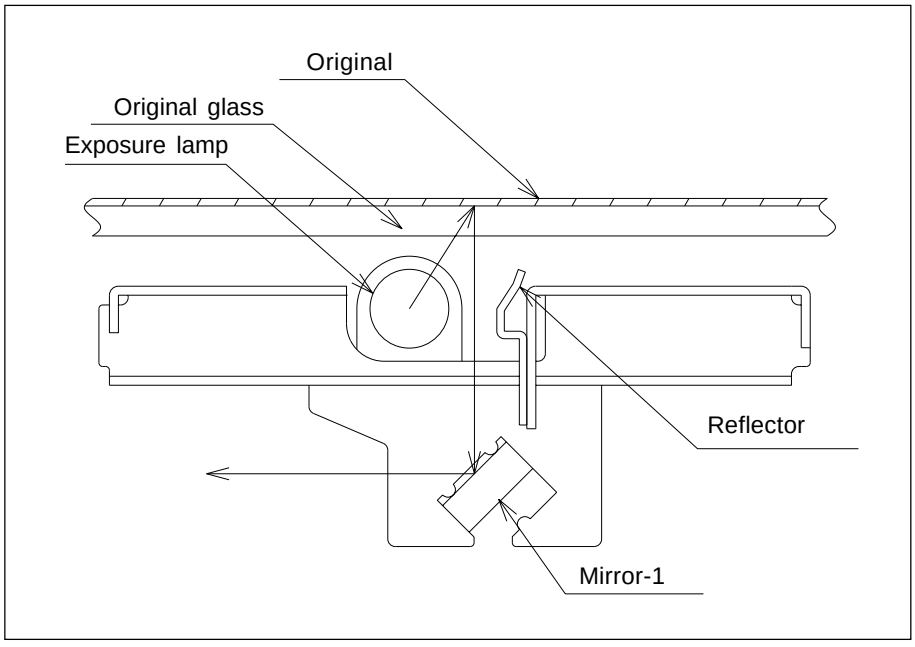
(1) Original glass

This is the glass on which originals to be copied are placed. The light from the exposure lamp is irradiated to the original through this glass.

(2) Carriage-1

The carriage-1 consists of the exposure lamp, lamp inverter, reflector, mirror-1, etc. It is driven by the scanner motor and scans the original on the glass.

a. Exposure lamp
   This lamp is the light source to irradiate the original on the glass (one 29W Xenon lamp).
b. Lamp inverter
   This inverter controls lighting of the Xenon lamp.
c. Reflector
   This is a plate to direct the light from the exposure lamp efficiently to the surface of the original on the glass.
d. Mirror-1
   This is a mirror to direct the reflected light from the original to the mirror-2 that is described later.



(3) Carriage-2

The carriage-2 consists of mirror-2, mirror-3, etc. and directs the reflected light from the mirror-1 through mirrors-2 and -3 to the lens.

This carriage-2 is driven by the scanner motor as the carriage-1, at half the scanning speed of carriage-1 (the scanning distance is also half of carriage-1).

(4) Lens unit

The light reflected from mirror-3 is led to the CCD placed at the focal point of the lens which is fixed in position.

(5) CCD board

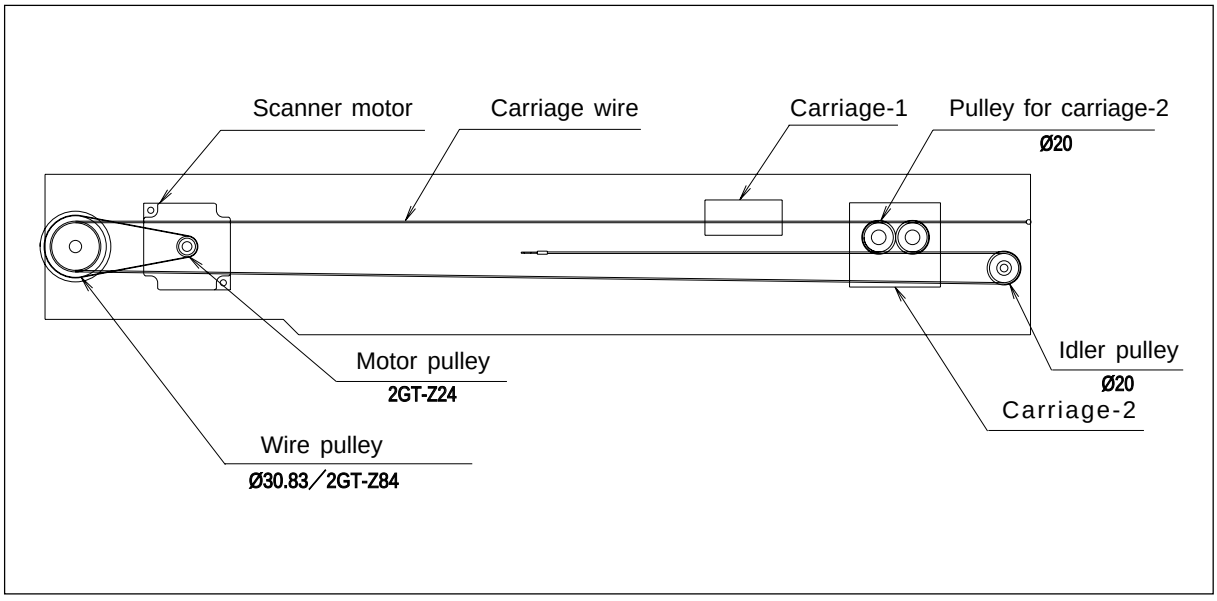
Processes such as the signal amplification, signal integration, A/D conversion and shading correction are applied on the electrical signal which has been converted by the CCD.

(6) Automatic original detection sensor

The size of the original placed on the glass is instantly detected using the automatic original detection sensors (APS sensor) fixed on the base frame without carriage-1 having to move.

6. 3. Operation

6. 3. 1. Scanner motor



(a) Scanning original on original glass

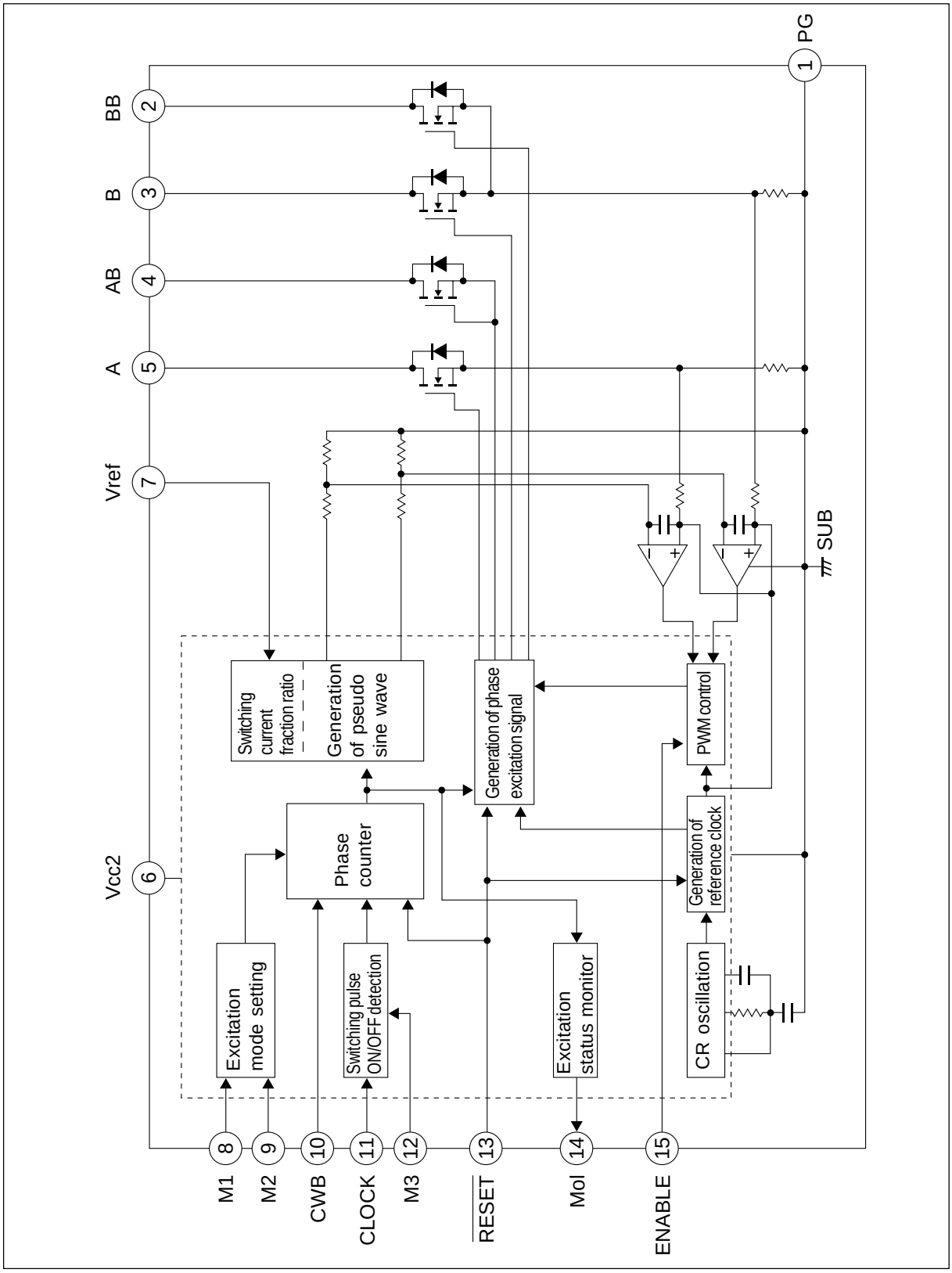
This motor drives the carriages-1 and -2 through the timing belt and carriage wire. The scanner motor first drives carriages-1 and -2 to their respective home positions. The home positions are detected when carriage-1 passes the home position sensor. When the [START] key is pressed, both carriages start to move and scan the original on the glass.

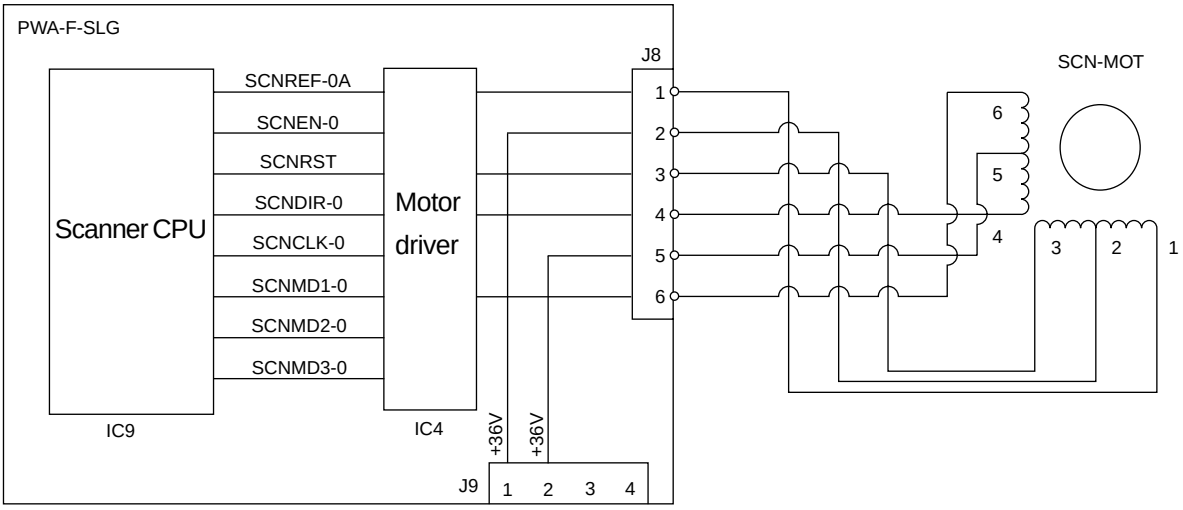
(b) Scanning original on RADF

Carriage-1 stays at the shading position during the shading correction, and at the scanning position during the scanning operation.

6. 3. 2. Two-phase motor drive circuit (fixed-current type)

The scanner motor with the unipolar fixed current chopper method is driven by the stepping motor driver STK672-080 (IC4).





Circuit diagram

Input signals

SCNCLK-0	CLK input	Input	The motor is rotated by setting the number of pulses. * The internal circuit of the motor driver works at the rising and falling edge of pulse.
SCNDIR-0	Sets the direction of motor rotation	Input	The direction of the motor rotation is determined by the setting level of signal "H"…Clockwise direction (as seen from the output shaft) "L"…Counterclockwise direction (as seen from the output shaft) **Note:** When SCNMD3-0 is "L", do not change the rotation direction within 6.25µs before and after the rising and falling edge of the pulse of SCNCLK-0.
SCNEN-0	Cuts OFF the drive output	Input	"H" …Normal operation (The motor has been excited.) "L"…Excitation drive output is forcibly shut OFF (the motor has not been excited).
SCNREF-0A	Voltage to set value for the motor current	Input	Motor wire current value is set in the range of 0 to 2.25 (A)/phase by applying the analog voltage 0 to 5 (V).
SCNMD1~3-0	Sets the exicitation mode (1)–(3)	Input	Sets the excitation mode. **Note:** Do not change the setting wihin 5µs before and after the rising and falling edge of the pulse of SCNCLK-0.
SCNRST	Reset	Input	Internal circuit of the driver is initialized by setting the motor to "L" level (pulse interval: 10µs or more). The motor drive circuit is automatically reset when the power is turned ON.

6. 4. Control for Exposure Lamp

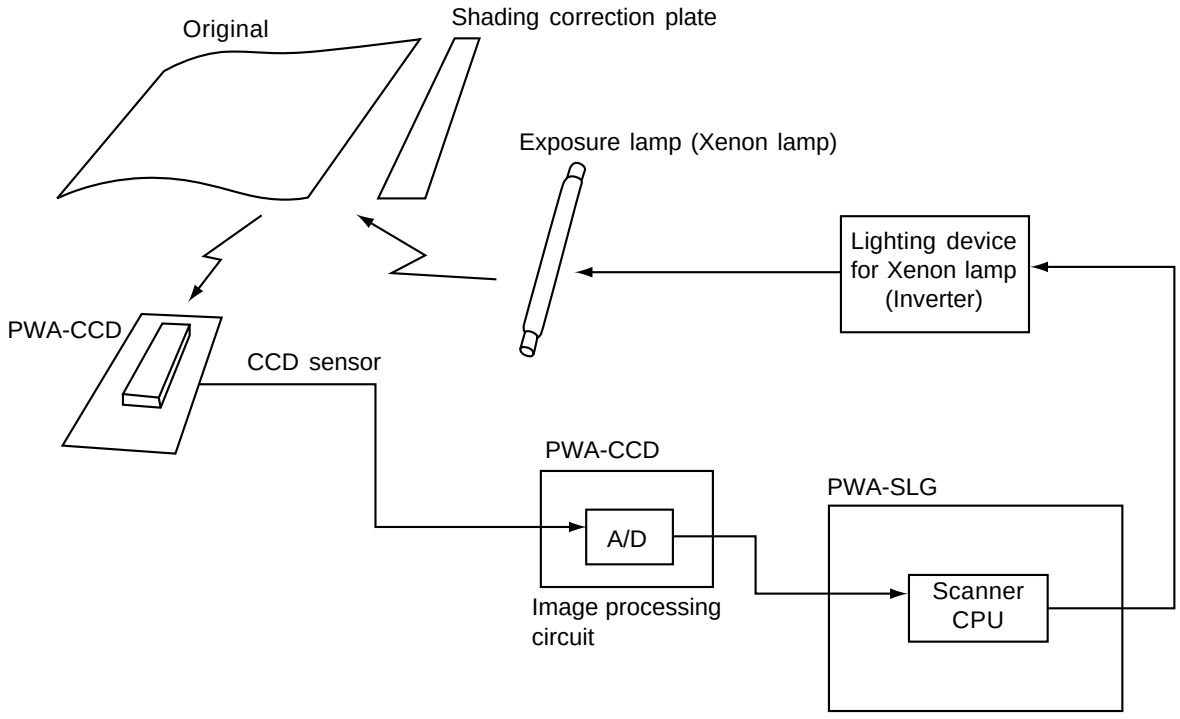
6. 4. 1. General description

Control circuit of the exposure lamp consists of the following 3 blocks.

(1) Lighting device for the Xenon lamp (Inverter)
Turns the exposure lamp ON/OFF.

(2) CCD sensor circuit
This circuit works to the convert the reflected light amount from the original surface and the shading correction plate to the electrical signals. The reflected light amount from the shading correction plate is read to control the exposure amount.

(3) Image processing circuit
The output signals from the CCD are digitized and the image processing such as gamma correction and shading correction is applied to them.



Construction of exposure lamp control circuit

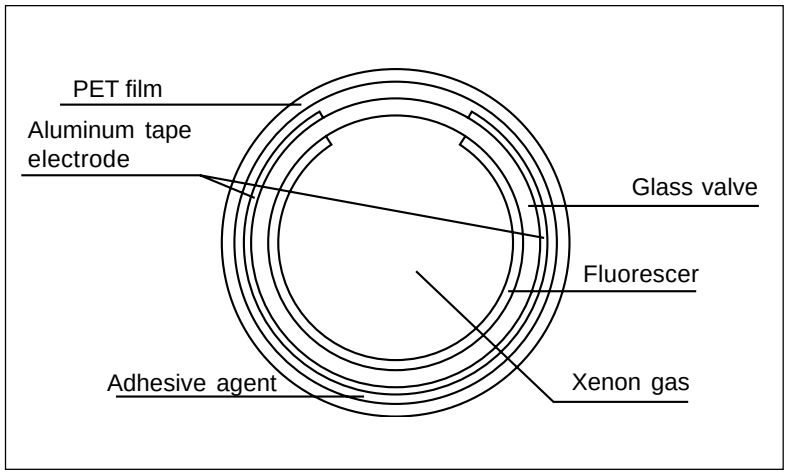
6. 4. 2. Exposure lamp

External electrode type Xenon fluorescent lamp is used as an exposure lamp in this copier.

(1) Structure

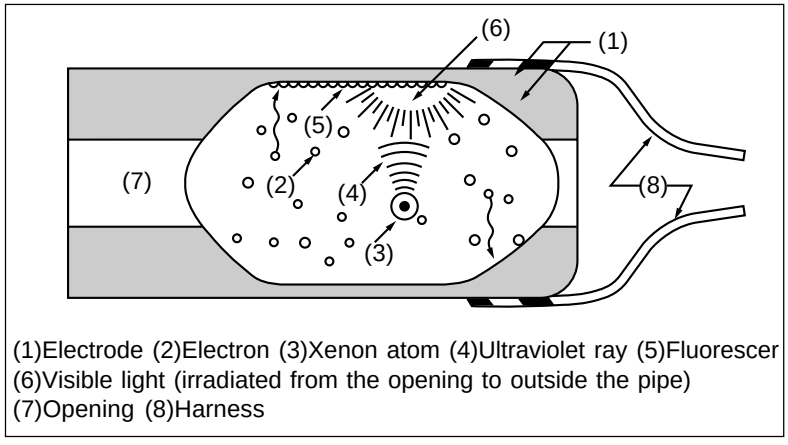
The fluorescer is applied to the inside surface of the lamp pipe (except for a part which serves as an opening) which is filled with the Xenon gas.

A pair of the external electrodes covered by film with adhesive agent is attached around the pipe.



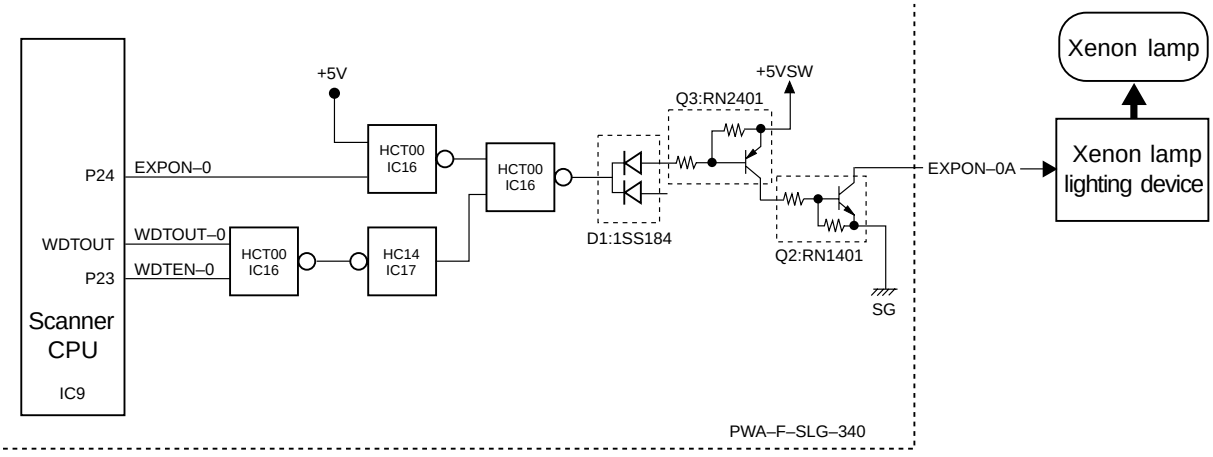
(2) Behavior inside the lamp

The electron inside the pipe is led to the electric field by applying voltage to the pair of the external electrodes, and the discharge is started. The electrons then flow and clash with the Xenon atoms inside the pipe to excite them and allow them to generate ultraviolet rays. This ultraviolet rays convert the fluorescer into visible light.



(1)Electrode (2)Electron (3)Xenon atom (4)Ultraviolet ray (5)Fluorescer
(6)Visible light (irradiated from the opening to outside the pipe)
(7)Opening (8)Harness

6. 4. 3. Control circuit for exposure lamp



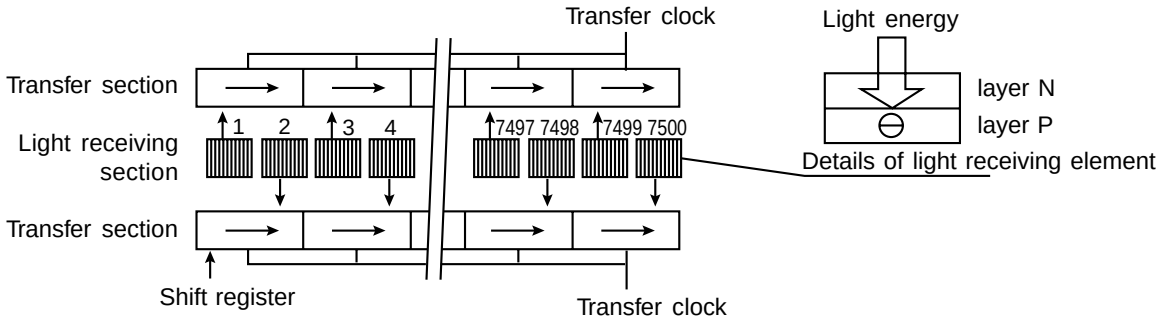
Working conditions

WDTOUT-0	WDTEN-0	**EXPON-0 (Lamp drive signal)**	+5VSW	Q2	Xenon lamp	State of copier
H	H	**H**	ON	OFF	OFF	Normal operation
H	H	**L**	ON	ON	ON	
L	X	**X**	OFF	OFF	OFF	Scanner CPU overdriving
H	L	**X**	OFF	OFF	OFF	Call for Service

6. 5. CCD Control

6. 5. 1. Opto-electronic conversion

A CCD (charge-coupled device) is used to produce an electrical signal corresponding to the reflected light amount from the original. The CCD is a one-chip opto-electronic conversion device, comprised of several thousand light-receiving elements arranged in a line; each one of them is a few microns square.
This model is equipped with a CCD which has 7,500 light-receiving elements.
Each element of the light-receiving section consists of the semiconductive layers P and N. When the light irradiates the element, the light energy produces a (-) charge in the layer P; the amount of the charge produced is proportional to the energy and irradiating time. The charges produced in the light-receiving section are then sent to the transfer section where they are shifted by the transfer clock from left to right as shown in the figure below, and are finally output from the CCD. At this time, to increase the transfer speed of the CCD, image signals in the even-number and odd-number elements are separated and output in parallel via two channels.



[Principle of the opto-electronic conversion by CCD]

6. 5. 2. Shading correction

Signal voltages read by the CCD have the following characteristics.

(1) Light source has variation in its light distribution.
(2) Since the light beam reflected from the original is converged using a lens, the light path is the shortest at the center of the CCD and the longest at ends. This causes difference in the amount of light reaching the CCD (i.e. the light amount is maximum at the CCD center, gradually decreases toward ends).
(3) Each of the 7,500 elements varies in the opto-electronic conversion efficiency.

These variations need to be corrected and this correction is referred to as shading correction. Based on the black and white data obtained in advance, a normalization process using the following formula is applied to the raw image data to correct lighting variance and element variation of the image data.

$$I = k \times \frac{(S - K)}{(W - K)}$$

k : Coefficient
S : Image data before correction
K : Black data (stored in “black” memory)
W : White data (stored in “white” memory)

6. 6. Automatic Original Size Detection Circuit

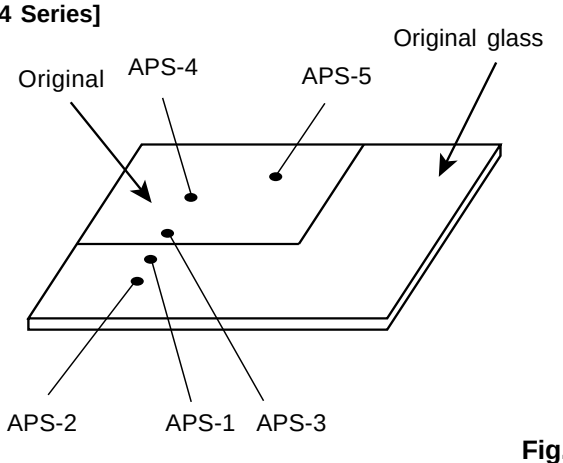
This circuit detects the size of original (standard sizes only) using the reflection type photosensors arranged on the base frame of the scanner unit.

6. 6. 1. Principle of original size detection

The reflection type photosensors are placed on the base frame of the scanner unit as shown in the Fig. 6.6-1. Each sensor consists of an infrared light emitting diode (LED) on the light emitting side, and a phototransistor on the light receiving side.

When there is an original on the original glass, light beams from the LEDs are reflected by the original and led to the phototransistors. This means that the size of the original is detected by checking which phototransistors are turned on or are not.

[A4 Series]



[LT Series]

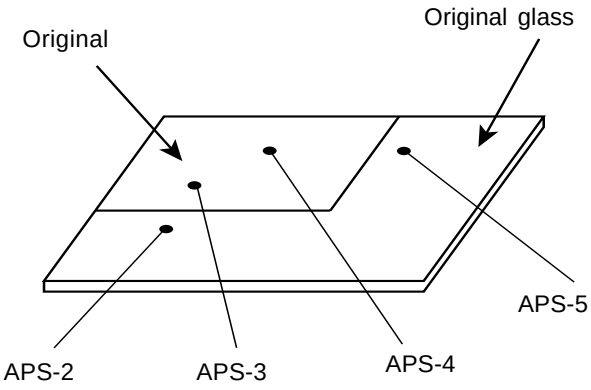


Fig. 6.6-1

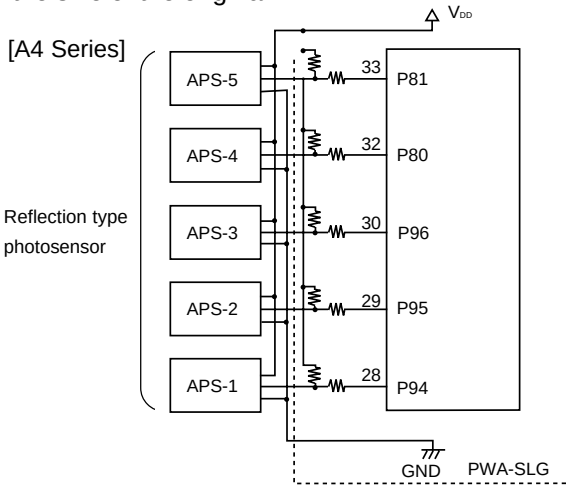
6. 6. 2. Process of original size detection

(1) When the copier is in the original size detection mode, the carriage-1 is set at its home position.

(2) When the RADF is opened, the sensors receive the light reflected from the original and if one of the matrix conditions shown in (4) for original sizes is satisfied, the size of the original is instantly detected.

(3) The output signal from each sensor is input to the CPU on the scanner control PC board to determine the size of the original.

[A4 Series]



[LT Series]

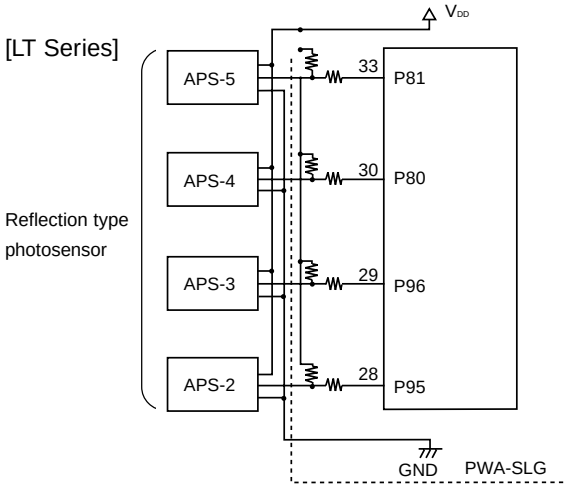
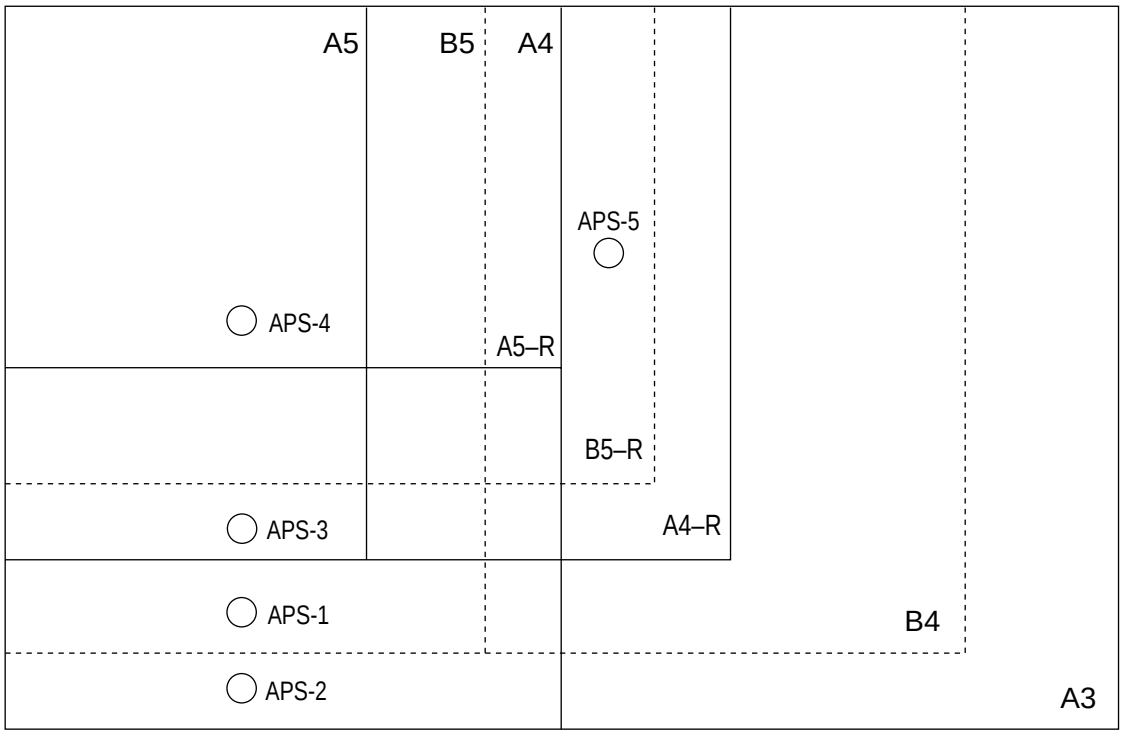


Fig. 6.6-2 Original size detection circuit

[A4 Series]



[LT Series]

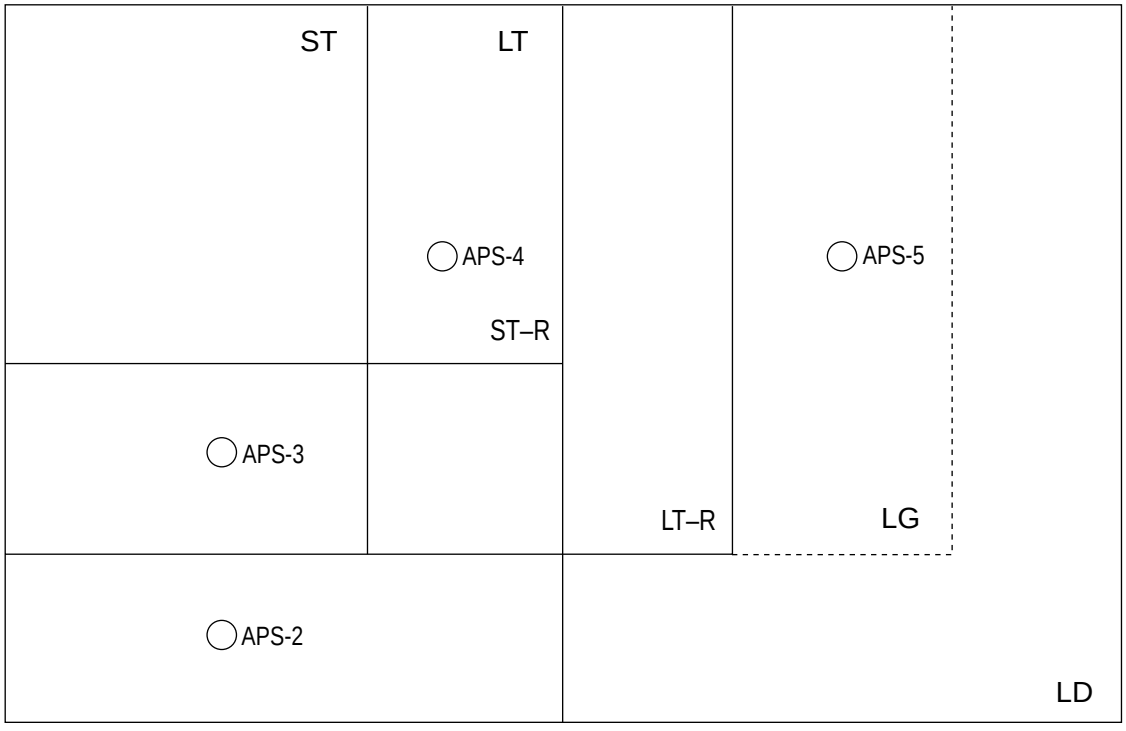


Fig.6.6-3 Sensor detection points

(4) Original size is determined by the combination of the presense/absence of signals which are output at each detection point. The combination chart for size determination of A4 series and LT series are as followed.

[A4 Series]

Size	APS-1	APS-2	APS-3	APS-4	APS-5
A3	0	0	0	0	0
A4	0	0	0	0	1
B4	0	0	0	1	0
B5	1	0	0	1	1
A4-R	0	0	1	1	0
A5	1	0	1	1	1
B5-R	0	1	1	1	0
A5-R	0	1	1	1	1

[LT Series]

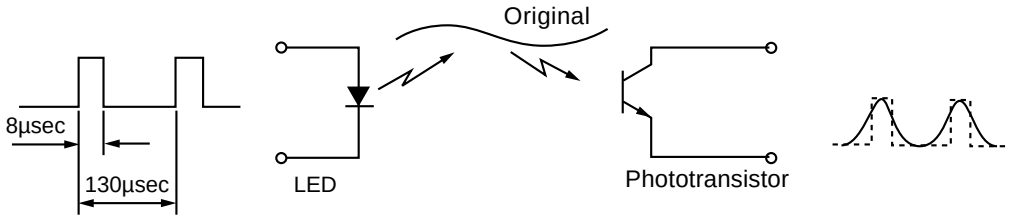
Size	APS-2	APS-3	APS-4	APS-5
LD	0	0	0	0
LT	0	0	0	1
LG	0	0	1	0
LT-R	0	0	1	1
ST	1	0	1	1
ST-R	0	1	1	1

Code	Output signal	Original
1	H	Absent
0	L	Present

* When the APS operation sensor is OFF;
  - The following points are determined by the output signals from APS sensors
    Size (The combination of the signals satisfy the above chart)
    : Size is displayed on the control panel and an appropriate paper and reproduction ratio are selected.
    Size retention (The combination of the signals do not satisfy the above chart)
    : Retains the latest original size recognized (or no original state) until a new paper size is recognized.
    No original (output from all the sensors are “1”.)
    : Reproduction ratio and paper size are not selected.
  - Size change is always observed and detected.
  - Carriage-1 stays at the standby position even if the reproduction ratio changes corresponding to the change of the original size.
* When the APS operation sensor is ON;
  Retains the latest original size (or no original state) recognized right before the APS operation sensor is turned ON regardless of the state of the APS sensor output signals.

About reflection type photosensor

The reflection type photosensor is comprised of an infrared light emitting diode and a phototransistor. It uses the pulse modulation to detect an original.

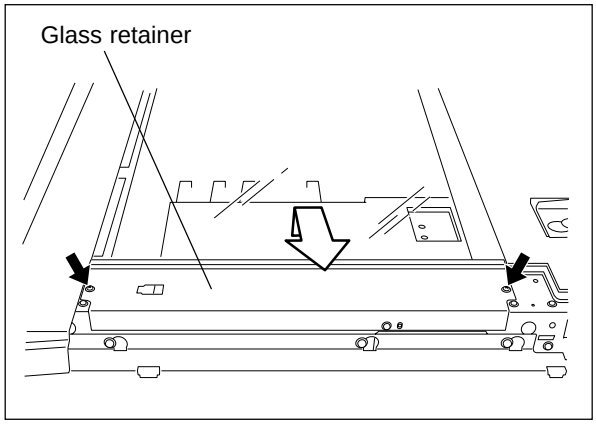


The light emitting diode is driven by a pulse having a 130-µsec cycle and an 8-µsec ON time. When the phototransistor receives the same signal as this pulse, it is determined that there is an original. The pulse modulation is performed inside the reflection type phototransistor.

6. 7. Disassembly and Replacement

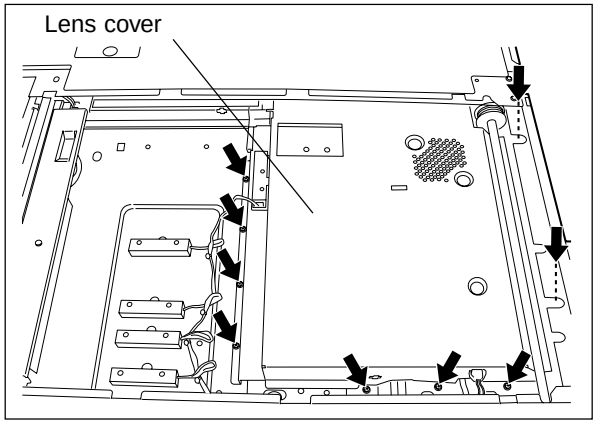
[A] Original glass

(1) Take off the right top cover.
(2) Remove 2 screws and take off the glass retainer.
(3) Lift the feed side of the original glass and take it off toward the feed side.



[B] Lens cover

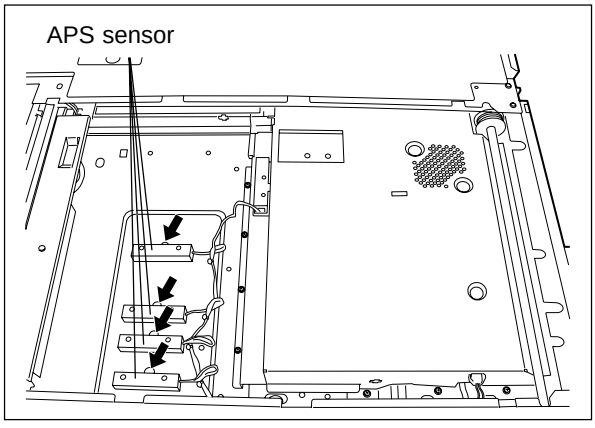
(1) Remove the original glass.
(2) Remove 9 screws and take off the lens cover. (Disconnect 1 connector of APS sensor at this time.)



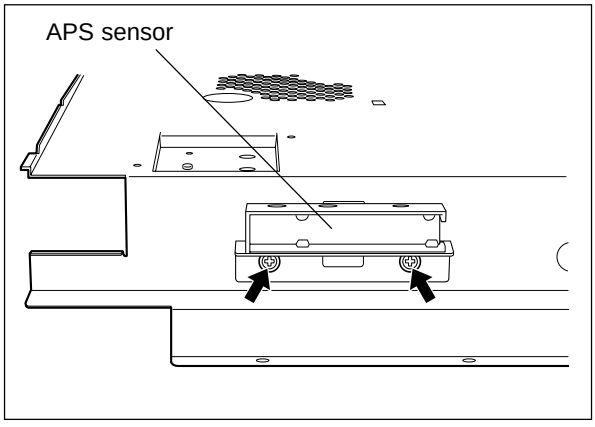
[C] Automatic original detection sensor (APS sensor)

(C-1) A4 series

(1) Remove the original glass.
(2) Take off 4 APS sensors each with disconnecting 1 connector and removing 1 screw.

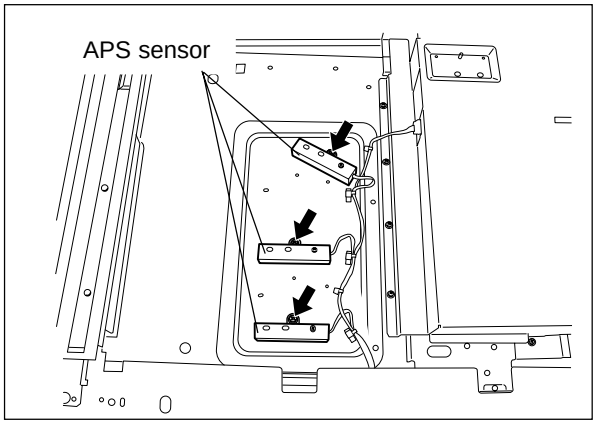


(3) Remove the lens cover.
(4) Remove 2 screws and take off the APS sensors with brackets.
(5) Remove 1 screw and release the APS sensors from the brackets.

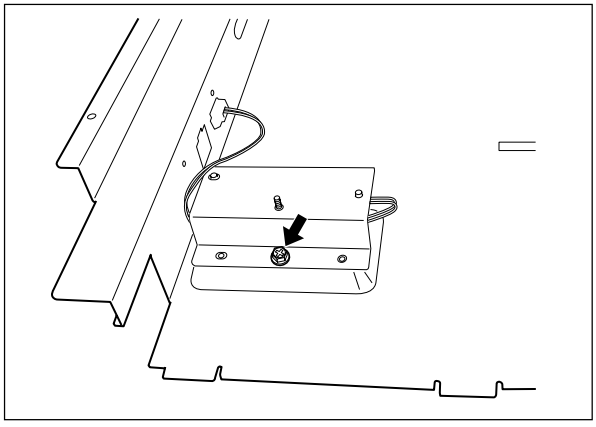


(C-2) LT series

(1) Remove the original glass.
(2) Take off 3 APS sensors each with disconnecting 1 connector and removing 1 screw.

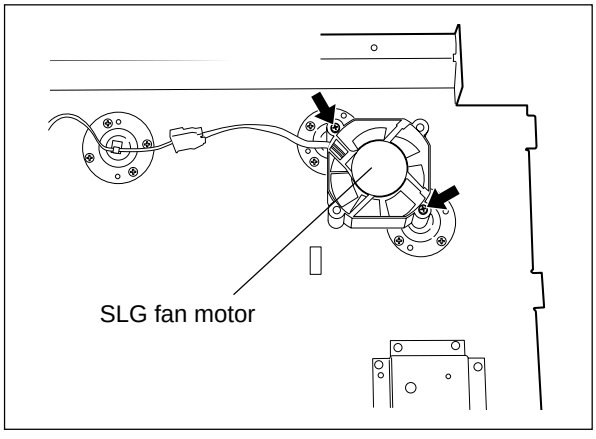


(3) Remove the lens cover.
(4) Remove 1 screw and take off the APS sensors with brackets.
(5) Remove 1 screw and release the APS sensors from the brackets.



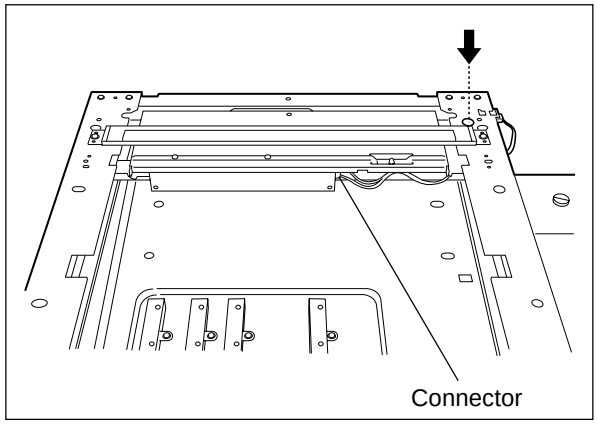
[D] SLG fan motor

(1) Remove the lens cover.
(2) Disconnect 1 connector, remove 2 screws and take off the SLG fan motor.

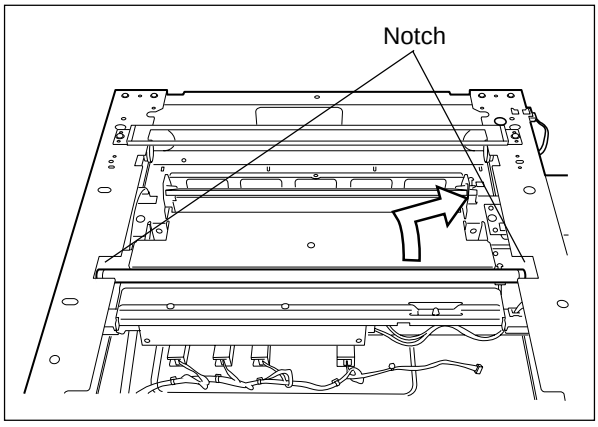


[E] Exposure lamp

(1) Move the carriages toward the exit side, disconnect 1 connector of the exposure lamp and remove 1 screw.



(2) Move the carriages to the notches of the frame and take off the exposure lamp with lifting the rear side of it.

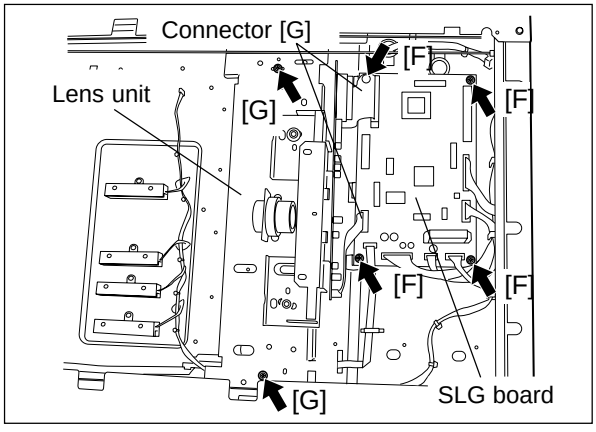


[F] Scanning section control PC board (SLG board)

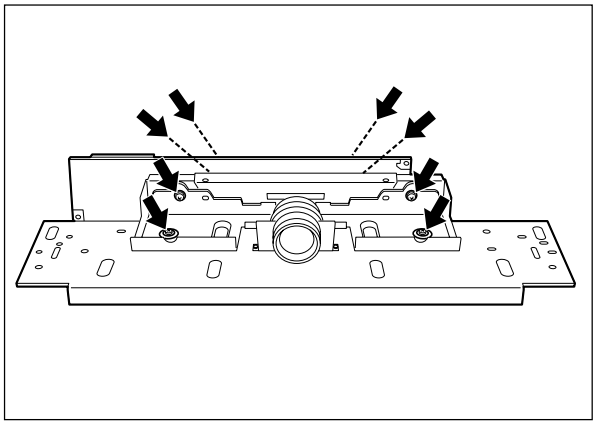
(1) Remove the original glass and lens cover.
(2) Disconnect 7 connectors, remove 4 screws and take off the SLG board.

[G] Lens unit

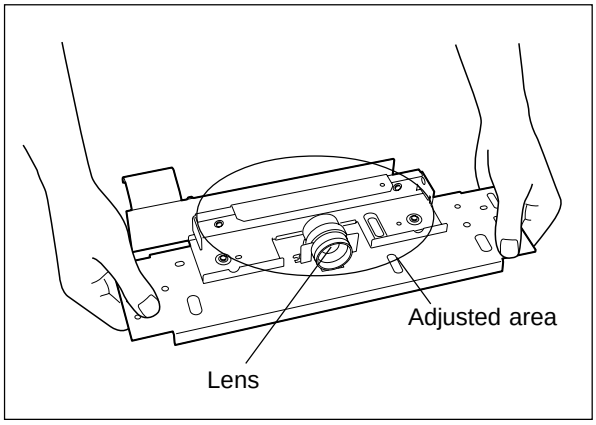
(1) Remove the original glass and lens cover.
(2) Disconnect 2 connectors, remove 2 screws and take off the lens unit.



Notes: 1. Do not touch the screws shown with the arrows (8 paint-locked screws) when changing the lens unit.

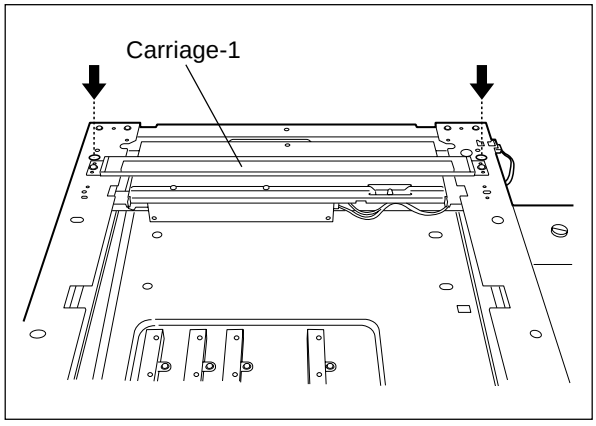


2. Handle the lens unit with enough care and do not touch the adjusted area and lens.

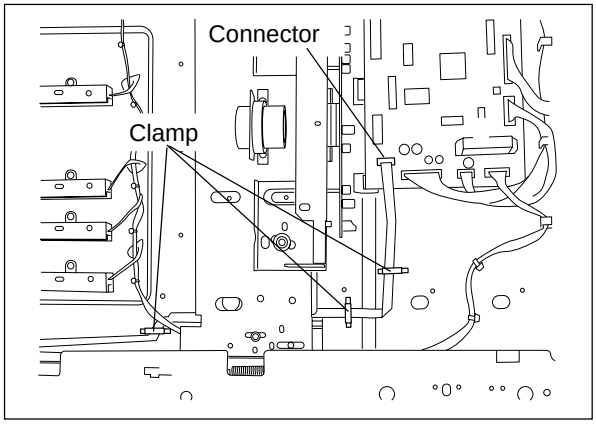


[H] Carriage-1/Carriage-2

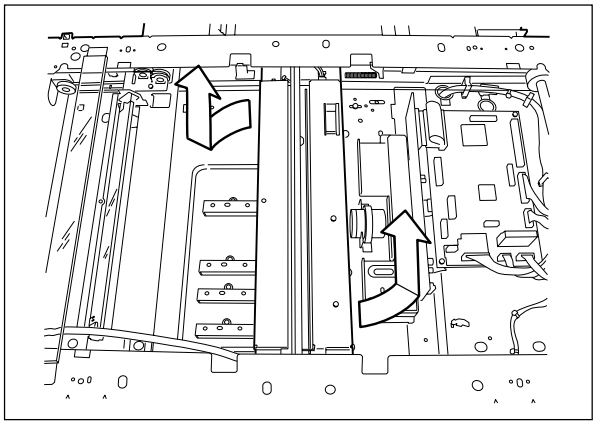
(1) Move the carriages toward the exit side.
(2) Remove 2 screws and take off the brackets fixing the carriage-1 to the wire.



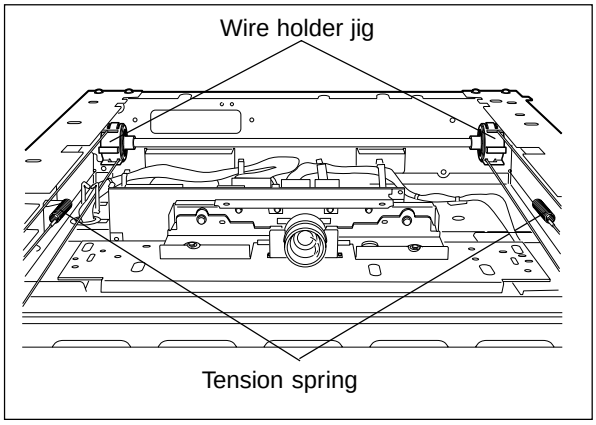
(3) Disconnect 1 connector of the lamp power supply cable and release the cable from 3 clamps.



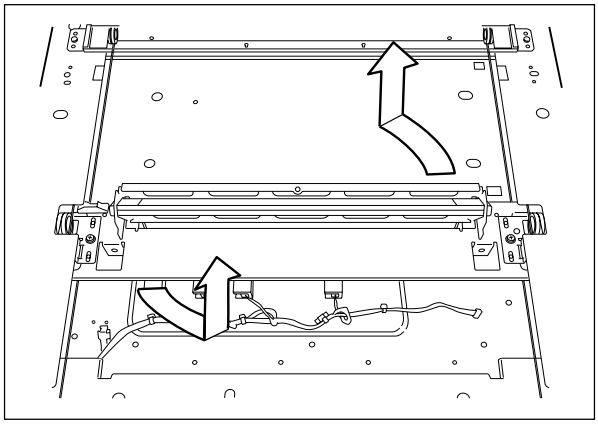
(4) Move the carriage-1 toward the center (at the position of the rear and front flame window) and take off the carriage-1 upward while tilting it.



(5) Attach the wire holder jigs to the wire pulleys not to uncoil the wire.
(6) Release 2 tension springs.



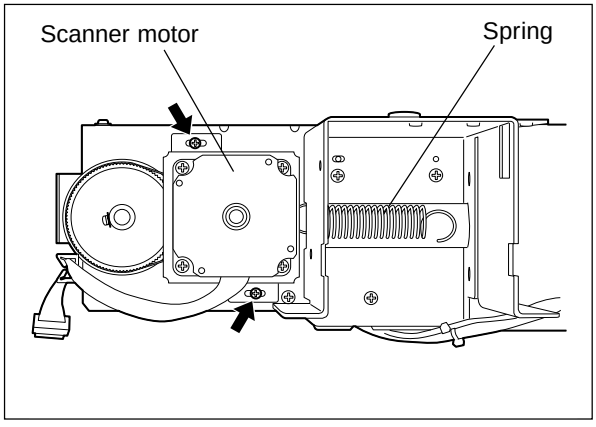
(7) Remove the wires and take off the carriage-2 upward while tilting it.



[I] Scanner motor

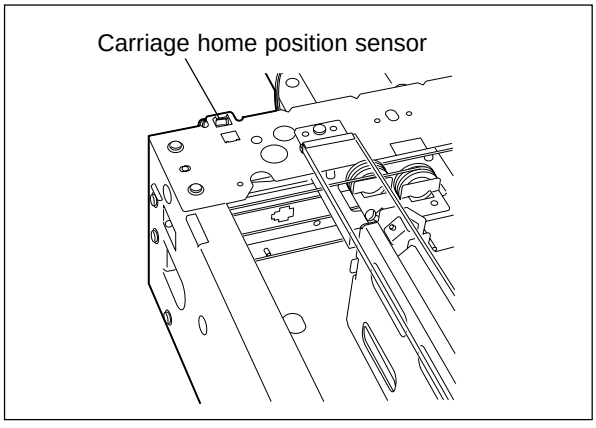
(1) Remove the feed side cover and disconnect the connector of scanner motor.
(2) Release 1 spring, remove 2 screws and take off the scanner motor with bracket.

Note: Take the following steps when installing the scanner motor.
1. Temporarily tack the bracket to the frame.
2. Put the spring on the motor and fix it with the screws at a balanced position.



[J] Carriage home position sensor

(1) Disconnect 1 connector, release latches and take off the carriage home position sensor.



7. IMAGE PROCESSING

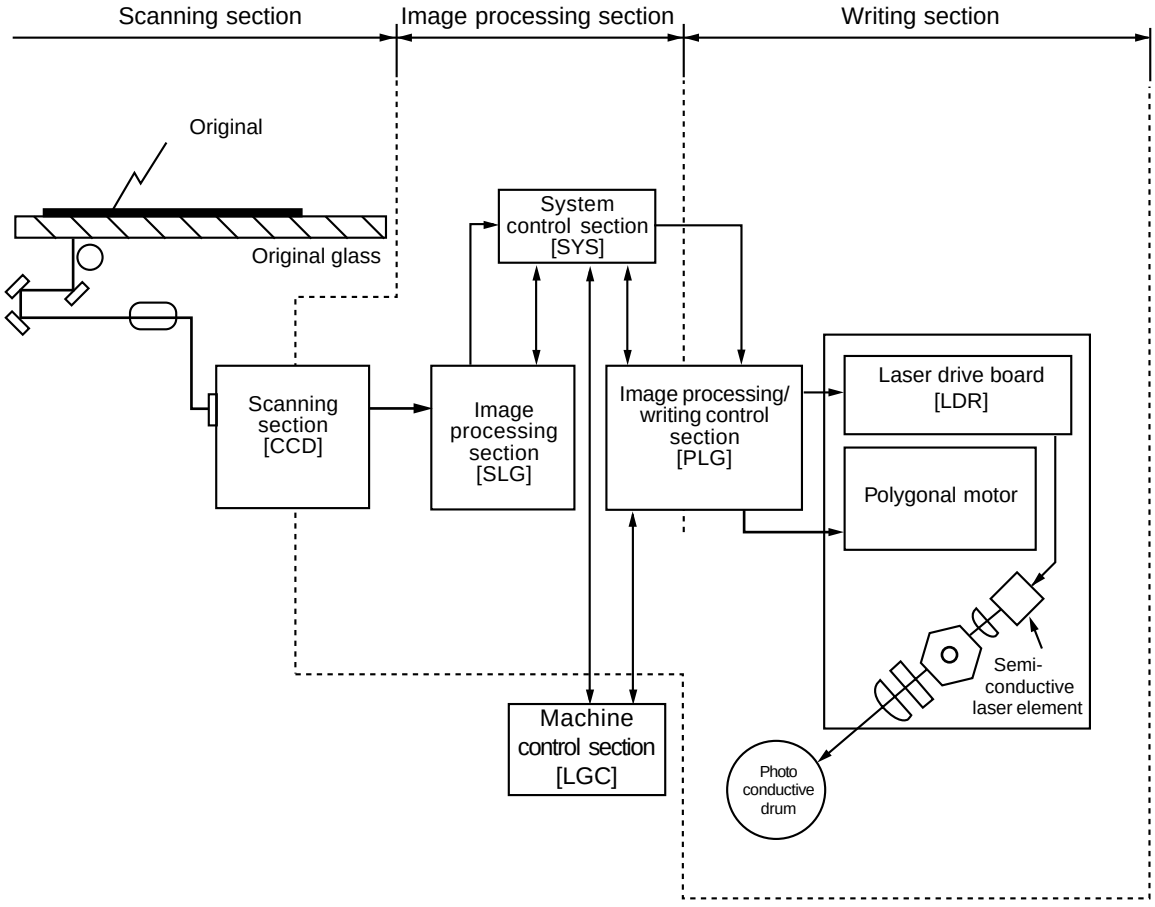
7.1. General Description
7.2. Image Processing Circuit
7.2.1. General description
7.2.2. Configuration
7.3. SLG Board (PWA-F-SLG-340)
7.3.1. Features
7.3.2. Functions of image processing circuit
7.4. PLG Board (PWA-F-PLG-340)
7.4.1. Features
7.4.2. Functions of image processing circuit
7.5. Scanning Section
7.6. Writing Section

7. IMAGE PROCESSING

7. 1. General Description

The following diagram shows the process from scanning of the original to data writing on the photoconductive drum surface of the digital copier.

ASIC stands for “Application Specific IC”, meaning an IC designed for a particular use.



The followings are the boards used for the image processing.

Board	Number of image processing ASIC	Function
SLG board (PWA-F-SLG-340)	1	High-quality image processing, image memory editing, editing processing, gamma correction, gradation processing, external output system interface
PLG board (PWA-F-PLG-340)	1	Smoothing processing, external input system interface, image area control, laser related control

7. 2. Image Processing Circuit

7. 2. 1. General description

The image of an original placed on the original glass is scanned by the carriage. The CCD (Charge Coupled Device) reads the optical image signals and converts them into the electrical signal. The electrical signals then undergo the analog-to-digital conversion and are changed into digital signal. The shading correction (correction of variance in CCD elements and the light source) is performed on the digital signal, then it is output as an image signal from the scanning section.

The image processing section receives this image signal from the scanning section and applies various types of image processing on it, then sends the output result to the writing section.

Images are processed by the SLG board (PWA-F-SLG-340) and PLG board (PWA-F-PLG-340).

(1) Image processing circuit on the SLG board

One image processing ASIC is mounted on the SLG board, realizing the following functions:

<Functions>

High-quality image processing, image memory editing, edit processing, gamma correction, gradation processing and external output system interface

(2) Image processing circuit on the PLG board

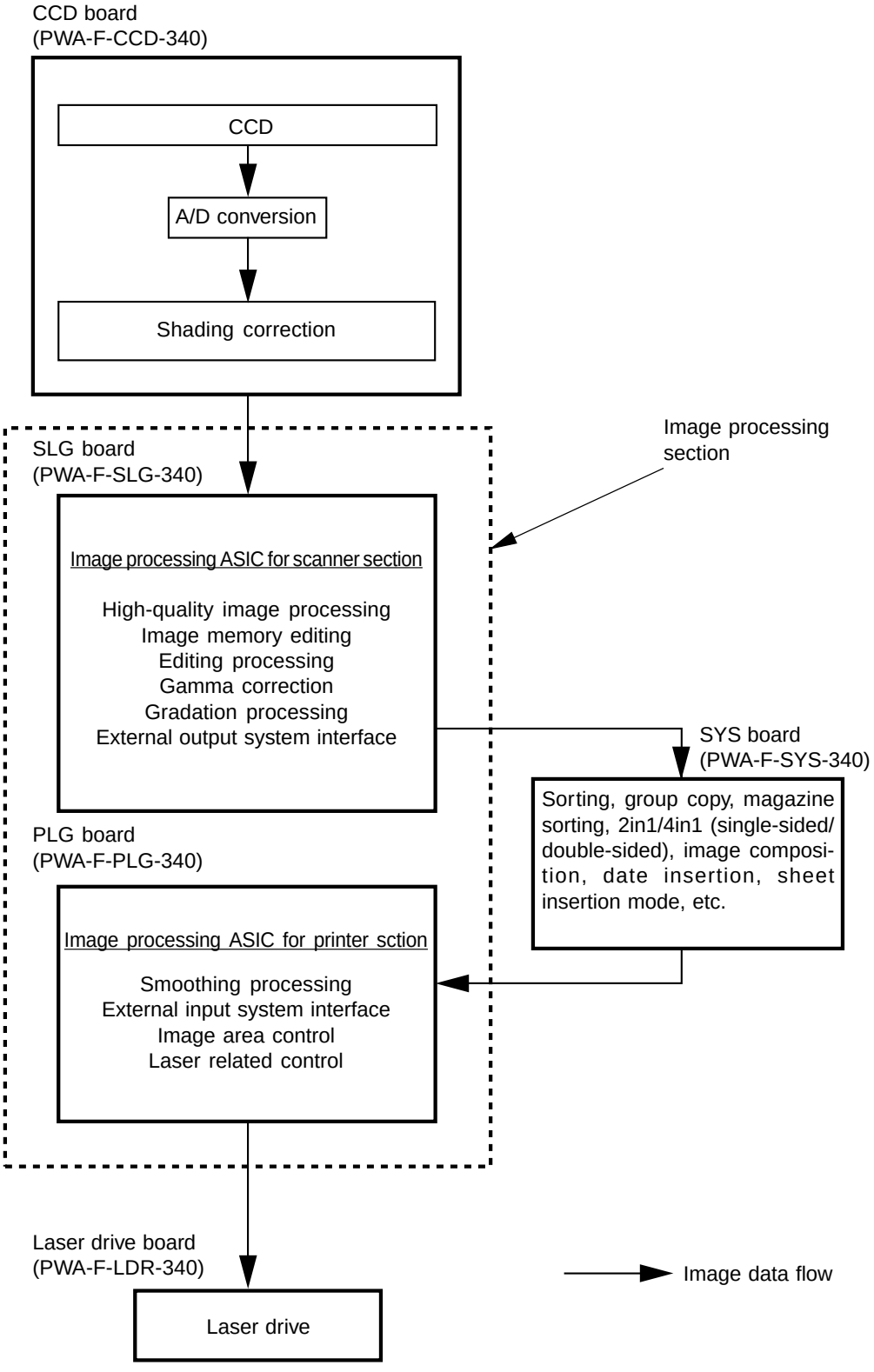
One image processing ASIC is mounted on the PLG board, realizing the following functions:

<Functions>

Smoothing processing, external input system interface, image area control and laser related control

7. 2. 2. Configuration

The following diagram shows the image processing section of this copier.



Configuration of image processing section

7. 3. SLG Board (PWA-F-SLG-340)

7. 3. 1. Features

(1) The image processing ASIC on the SLG board is controlled by the CPU on the SLG board.

(2) The image processing ASIC on the SLG board realizes the following functions:

- High-quality image processing
- Image memory editing
- Editing processing
- Gamma correction
- Gradation processing
- External output system interface

7. 3. 2. Functions of image processing circuit

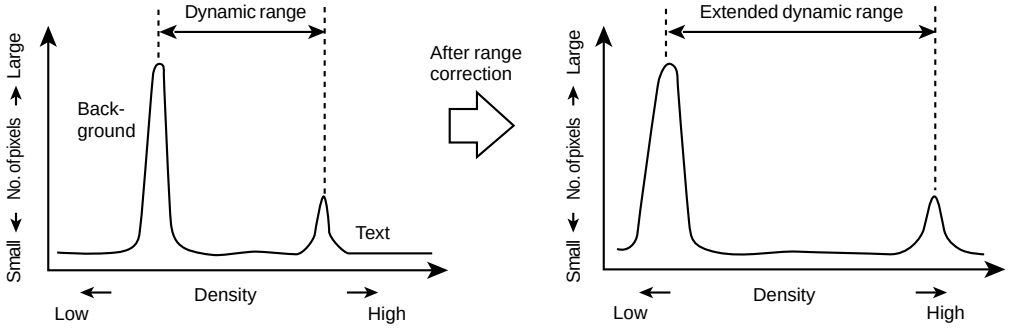
An image processing ASIC mounted on the SLG board realizes the following functions:

(1) High-quality image processing

(a) Range correction

This function corrects the density range of the image signals, and adjusts it so that it is suited to each original image. It is possible to eliminate undesirable background density when an original with a certain level of density on the background, for example a newspaper, is copied.

<Example>



Histogram

(b) Filtering

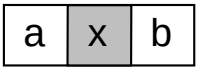
This function is enabled by a low-pass filter circuit and a high-pass filter circuit.

- Low-pass filter circuit

  This circuit removes image noise and electrical noise, decreases moire, and realizes high reproducibility of original by applying an averaging operation on the image signal of the targeted pixel and those of the pixels positioning next to it.

  <Example> The density of the targeted pixel position is “x”. The density of the pixel positions at the front and back of the targeted pixel are “a” and “b” respectively, “x” is converted to “ x’ ” through low pass filtering.

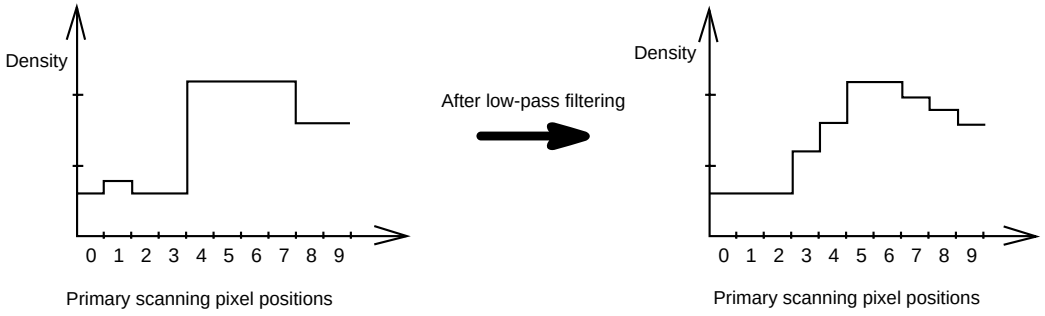
  When the matrix is (3 x 1):



$$x' = \frac{a + b + x}{3}$$

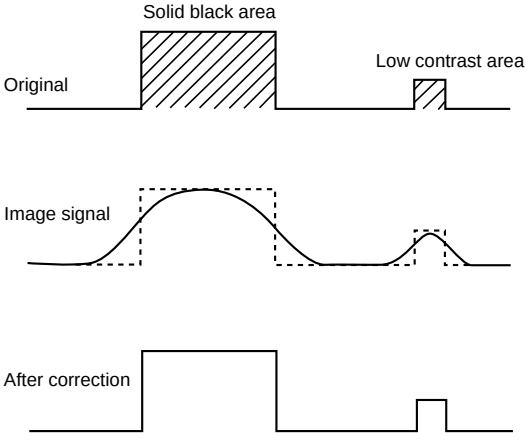
  The above averaging operation is performed for all the pixel positions to accomplish the high reproducibility of the original.

  The following is when low pass filtering is applied on the primary scanning pixel.


Density
0 1 2 3 4 5 6 7 8 9
Primary scanning pixel positions
After low-pass filtering
Density
0 1 2 3 4 5 6 7 8 9
Primary scanning pixel positions

- High-pass filter circuit

  The change of the density at the character outline becomes smooth when an original, such as text, with a great difference in density between the pixels placed next to one another is optically scanned and output from the CCD. This is caused by the characteristic of the lens and other factors. In this copier, the process such as the edge enhancement, is applied on the targeted pixel and the pixels around it to eliminate this phenomenon and realize high reproducibility of the original.



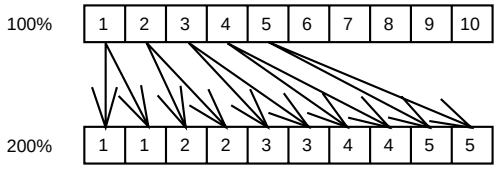
(2) Image memory editing

This function performs editing such as enlargement/reduction, mirror imaging, etc. using the line memory. Pixel data for one line in the primary scanning direction are stored in the line memory and the memory is renewed at each line.

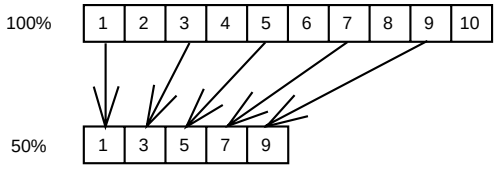
(a) Enlargement/reduction

The enlargment/reduction is accomplished by using the line memory control function in the process of the image processing operation.

<Example> Enlargement



<Example> Reduction



(b) Mirror imaging

This is accomplished by reading and outputting data from its end.

(3) Edit processing

This function performs trimming, masking and negative/positive reversing.

(a) Trimming

Using rectangular area signals, the image signals inside the rectangular area are left and the other image signals outside the area are eliminated.

(b) Masking

Using rectangular area signals, the image data inside the rectangular area are erased.

(c) Negative/positive reversing

This function reverses the entire data from negative to positive or vice versa.

(4) Gamma correction

This function corrects the input/output characteristics of the scanner/printer and adjusts the image signals so that their input/output characteristics match with the copy mode.

(5) Gradation processing

This function works for genuine reproduction of halftone image such as photographs.

(6) External output system interface

This function controls the output of the output interface between the SLG board and the SYS board (PWA-F-SYS-340).

7. 4. PLG Board (PWA-F-PLG-340)

7. 4. 1. Features

(1) The image processing ASIC on the PLG board is controlled by the CPU on the PLG board.

(2) The image processing functions of the PLG board realizes the following functions:

- Smoothing processing
- External input system interface
- Image area control
- Laser related control

7. 4. 2. Functions of image processing circuit

An image processing ASIC mounted on the PLG board enables the following functions:

(1) Smoothing processing

This function removes jagginess and smoothes character outline of the text images input from the external input system interface, and output them.

(2) External input system interface

This function controls the input interface between the PLG board and the SYS board (PWA-F-SYS-340).

(3) Image area control

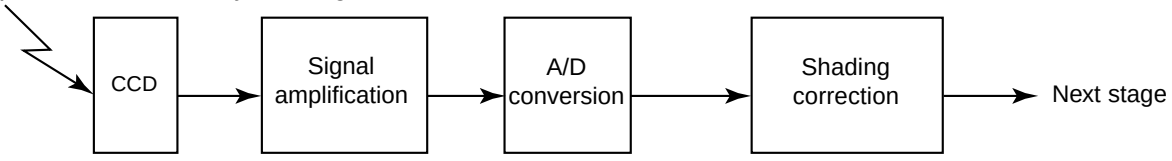
This function sets the effective image area of four directions for the image to be output.

(4) Laser related control

This function controls the APC (Auto Power Control).

7. 5. Scanning Section

Light reflected from original surface is directed to the CCD which performs the opto-electronic conversion, and the optical image data are converted into an electrical signal. This analog signal undergoes the A/D conversion processing and is changed into a digital signal. The signal then undertakes various corrective processes necessary for image formation.



(1) Opto-electronic conversion
The CCD elements convert the optical signal into electrical signal. (► Chap.6.5.1)

(2) Signal amplification
Amplifies the electrical signals converted in the CCD.

(3) A/D conversion
Converts the analog signal into the digital signal.

(4) Shading correction
The shading correction is applied on the signal read by CCD. (► Chap.6.5.2.)

7. 6. Writing Section

The image signal processed by the PLG board is processed by the ASIC for writing control and laser drive board. The laser is controlled based on the signal, writing data on the drum.

(1) Setting the effective image area ..... • Top, bottom, left and right margins

(2) Horizontal synchronization signal (H-Sync) ..... clock generation section • The reference clock signal in the printer section synchronized with the H-Sync and its signal.

(3) Laser drive section ..... • ON/OFF control of the semiconductive laser and APC (Auto Power Control) control.

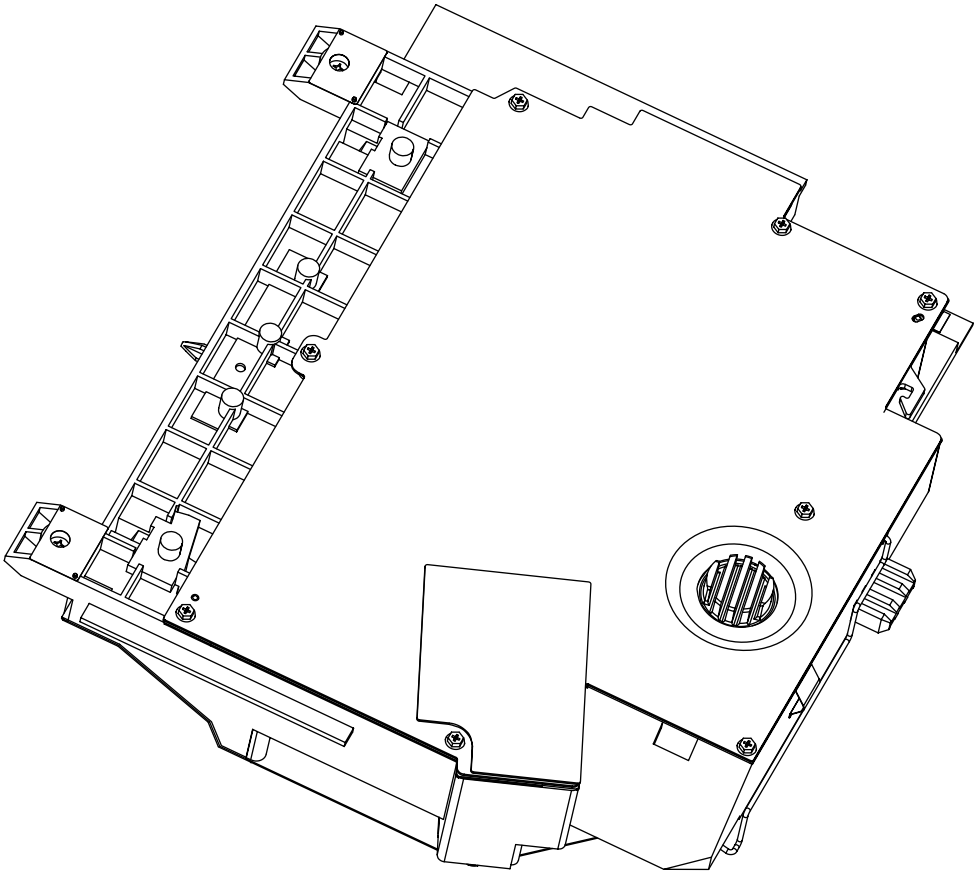
8. LASER OPTICAL UNIT

8. 1. General Description
8. 2. Structure
8. 3. Laser Diode
8. 4. Disassembly and Replacement

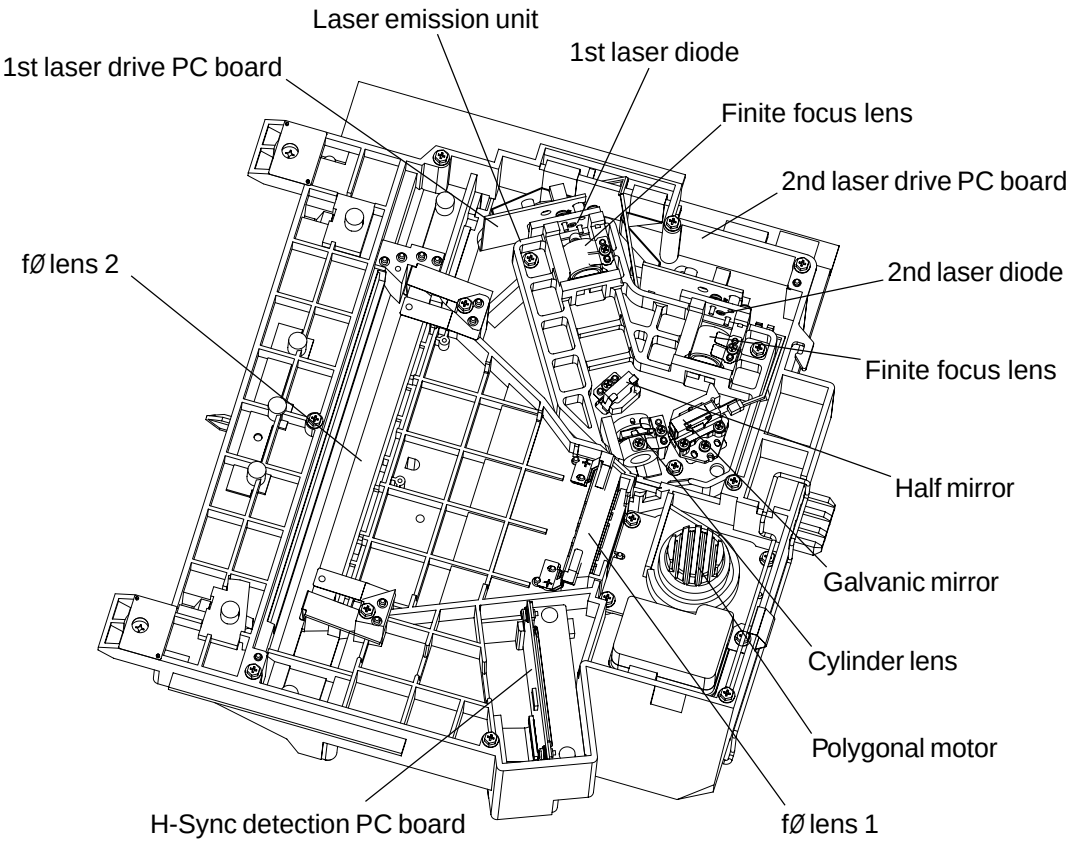
8. LASER OPTICAL UNIT

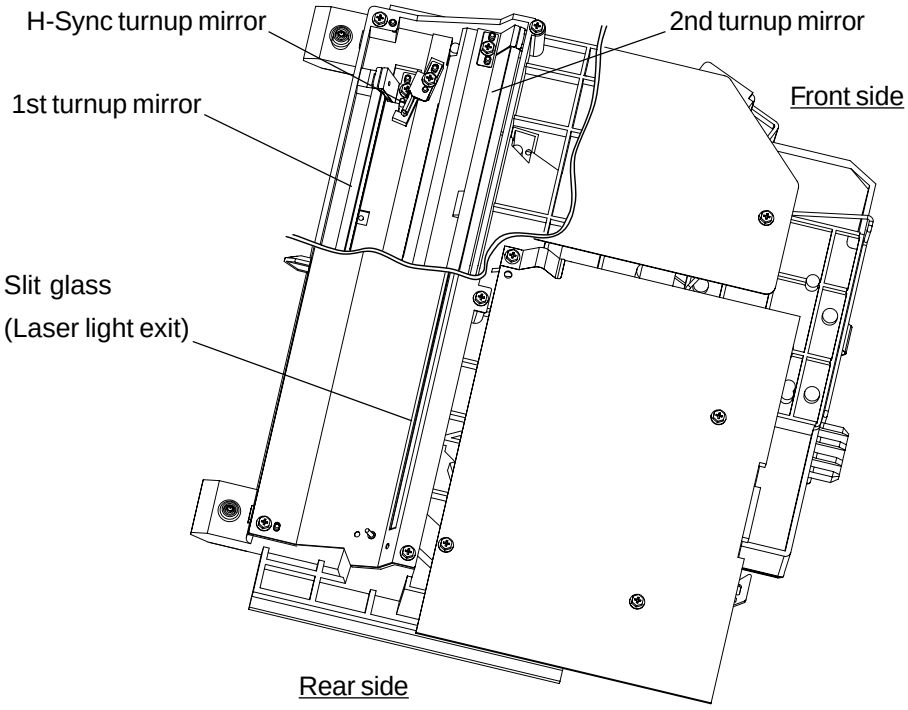
8. 1. General Description

The laser optical unit radiates the laser beam onto the photoconductive drum responding to the digital image signals, which have been sent from the scanner, printer controller, etc., to create a latent image.
The Image signal are converted into the light emission signal of the laser diode on the laser driver board, and it is rediated on the drum through the optical elements such as cylinder lenses, polygonal mirror and fØ lens.
This unit must not be disassembled in the field since it is finely adjusted and very sensitive to dust.



[Laser optical unit exterior view]





[Laser optical unit overview]

8. 2. Structure

(1) Laser emission Unit

This unit consists of the laser diode, finite focus lens and aperture.

a. Laser diode

This laser diode features low droop, small laser variation and low threshold current.

Aperture determines the shape of the laser beam at laser emission position.

Laser diode radiates the laser beams responding to the laser emission control (ON/OFF) signals from the laser drive board. Laser beams which passed through the finite focus lens are focused on the drum surface.

b. Caution

The beam of the semiconductor laser is very weak (about 5 mW), but focused parallel rays creates great energy which is hazardous.

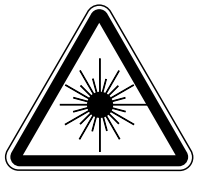
Some material of the components of the laser optical unit are metal. Since the unit is in a sealed container, there is no danger of laser leakage during normal operation.

Note: Laser beam is not visible pay the closest attention when handling the laser unit components or performing operations such as adjustment of the laser beam, and this kind of operations which are very dangerous must be performed only by specially trained staff.

The warning label shown below is attached on the front side left inner cover.

DANGER - INVISIBLE LASER RADIATION WHEN OPTICAL UNIT OPEN OR DRUM UNIT REMOVED AND INTERLOCK DEFEATED. AVOID DIRECT EXPOSURE TO BEAM. >PS<

VORSICHT - UNSICHTBARE LASERSTRAHLUNG, WENN DIE ABDECKUNG GEÖFFNET ODER DIE TROMMEL ENTFERNT UND DIE VERRIEGELUNG UNWIRKSAM GEMACHT WIRD. NICHT DIREKT DEM STRAHL AUSSETZEN.



DANGER - RAYON LASER INVISIBLE LORSQUE LE BLOC OPTIQUE EST OUVERT, LE TAMBOUR RETIRE ET LE VERROUILLAGE HORS D' USAGE. EVITER L'EXPOSITION DIRECTE AU RAYON.

PELIGRO - RADIACION INVISIBLE DE LASER CUANDO LA UNIDAD OPTICA ESTA ABIERTA O LA UNIDAD DEL CILINDRO ES RETIRADA Y CUANDO EL INTERRUPTOR DE SEGURIDAD ESTA DESACTIVADO. EVITE EXPOSICION DIRECTA AL RAYO.

危険–ドラムユニットを外したり光学ユニットを開けたときドアスイッチを無効にすると不可視レーザー放射の恐れあり。ビームへの直接暴露を避けよ。

[CAUTION]

- Do not approach tools near the path of the laser beam.
- Take off your watches, rings, bracelets, etc. when handling the unit.

(2) Polygonal motor unit

This unit consists of the polygonal motor, polygonal mirror and polygonal mirror cover.

a. Polygonal motor

This motor rotates the polygonal mirror in high speed.

The DC motor controls the rotation speed of the mirror motor as follows:

During standby :10,000.000 rpm (approx.)

During copying :37,216.337 rpm (approx.)

b. Polygonal mirror

Laser beams emitted from the laser diode are reflected by this mirror. As the polygonal mirror is rotated by the polygonal motor, the reflected laser light moves in sync with the rotation. The direction of the movement is the primary scanning direction of the image. Two scan is performed on one plane of the polygonal mirror. As the polygonal mirror has eight planes, sixteen scans are performed in one rotation of the polygonal mirror.

c. Polygonal mirror cover

Polygonal mirror cover reduces the windage loss and noise, prevents adhesion of foreign objects onto the mirror surface and releases heat.

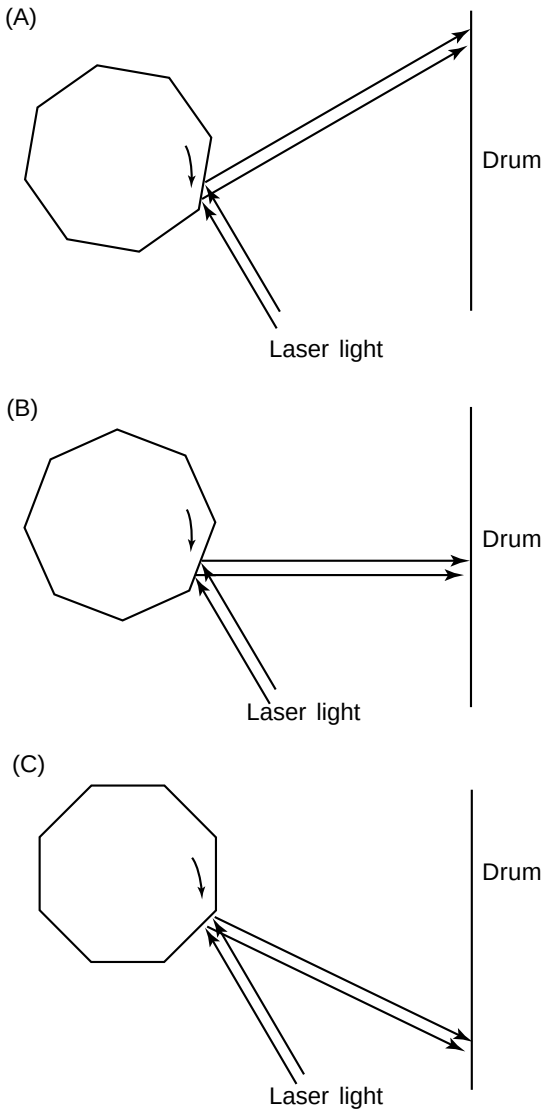


Fig. 8.2-1

2 scan is completed by completion of steps (A) to (C). 2 scan is performed on one plane of the polygonal mirror. 16 scans can be made with one rotation of the polygonal mirror.

(3) fØ lenses 1 and 2

These two lenses perform the following adjustment on the laser beams reflected by the polygonal mirror.

a. Uniform-velocity scanning

Since the polygonal mirror is rotating at a uniform velocity, the laser beam reflected from the mirror scans over the drum surface at a uniform angular velocity; namely, the pitch between the dots on the drum is wider at both ends than at the center of the scanning range. The fØ lenses help to correct this difference, making all the dot-to-dot pitches equal on the drum surface.

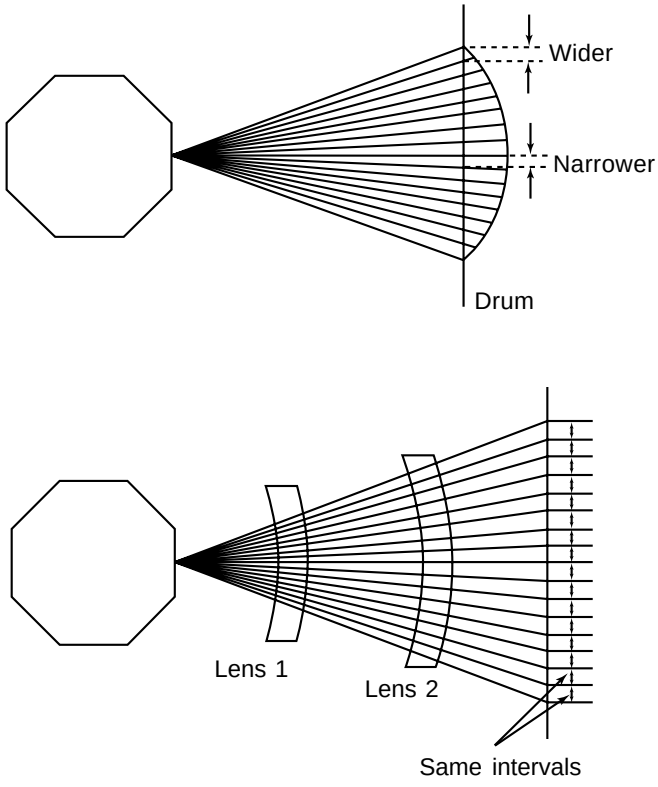


Fig. 8.2-2

b. Face tilt connection

The reflecting face of the polygonal mirror is tilted slightly to one side against the perfect vertical. Horizontal deviation of the laser light which is caused by the tilt is corrected.

c. Sectional shape of laser beam

The shape of the laser beam spotted on the drum is adjusted.

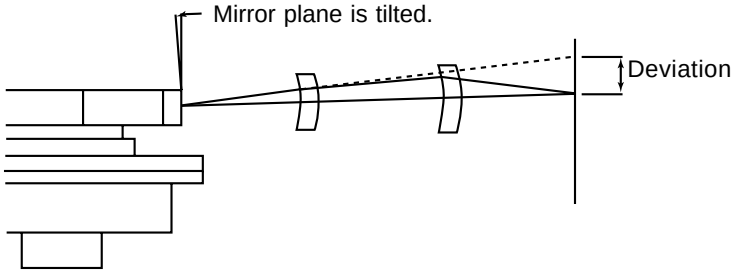


Fig. 8.2-3

(4) H-Sync detection PC board

The laser light which is started to be scanned from one of the reflected face of the polygonal mirror is reflected by the H-Sync detection mirror and goes into the PIN diode on the H-Sync detection PC board. The primary scanning synchronizing signal is generated based on this reflected laser light.

The rudder sensor is attached to the H-Sync sensor to evenly space (42.3µm), by its detection value, the intervals of the secondary scanning of the first and second beams.

(5) Laser drive board

This control board has the following functions:

a. APC control function (adjusts disparity of the laser intensity caused by temperature)
b. Laser ON/OFF function
c. Function to generate the primary scanning synchronizing signals

(6) Slit glass

Slit glass is located where the laser beams are output from the laser optical unit, and it protects the unit from dust.

8. 3. Laser Diode

The laser used in this copier is a A1GaAs type semiconductive laser. It is generated in the single-horizontal mode, and its wavelength is approx.780nm. This semiconductive laser outputs 15mW with standard DC power supply. Laser intensity is controlled by using the output from the PIN diode for monitoring light output in the semiconductive laser.

The relation between the current and optical output of the semiconductive laser is as shown at right. Light emission is started when the forward current reaches or becomes greater than the threshold current and outputs the monitor current which is propostioned to the optical output. The threshold current and monitor current differs depending on the semiconductive lasers due to their individual nature. Optical output has to be adjusted to maintain a constant value.

Since the optical output of the semiconductive laser is decreased when the temperature of the laser rises, APC control needs to be performed to maintain a constant optical output.

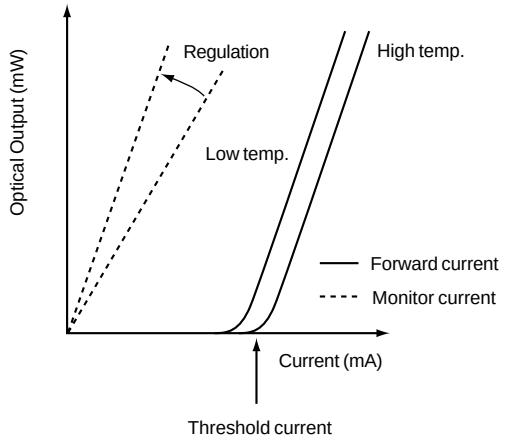


Fig. 8.3-1

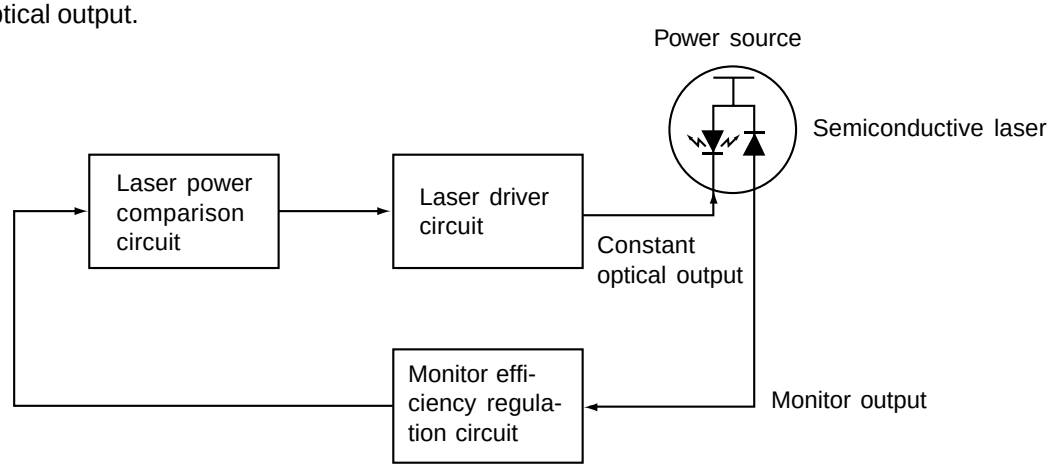


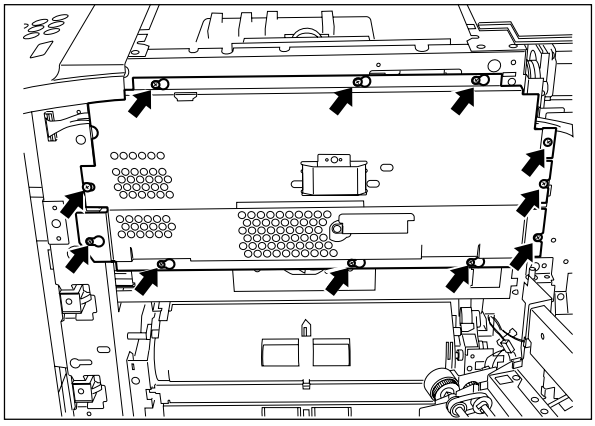
Fig. 8.3-2 Block diagram

Fig. 8.3-2 shows a block diagram of the semiconductive laser control circuit. The semiconductive laser performs monitor efficiency regulation (a process to control monitor current for the light amount), and laser itself is adjusted to initially output emission of approx. 2.6mW (395µW on the drum surface). The regulated voltage of the monitor output is given feedback to the laser power comparison circuit. This monitor output voltage is compared with the laser power voltage set for the control circuit for every scanning. Laser driver circuit increases the forward current if the laser power is insufficent and drecreases the current when the power is excessive to maintain a constant optical output.

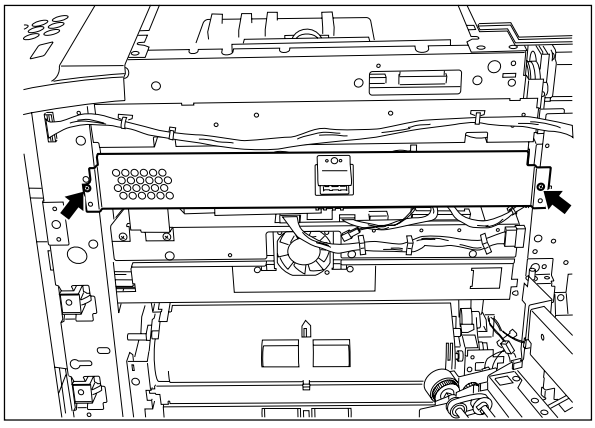
8. 4. Disassembly and Replacement

[A] Laser fan motor

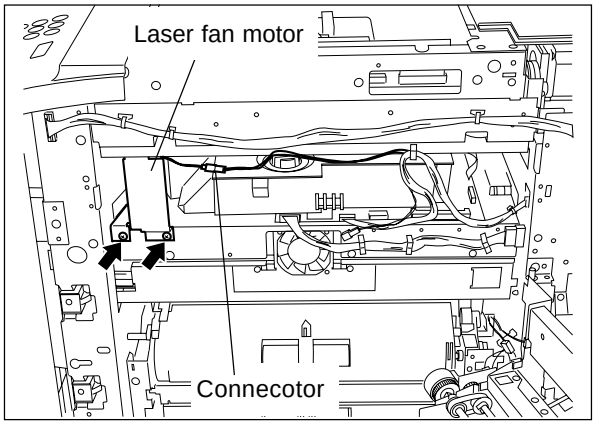
(1) Remove the top right cover, feed side upper cover and feed side center cover. Remove 1 screw and loosen 10 screws and take off the plate cover.



(2) Remove 2 screws and take off the optical unit fixing stay.



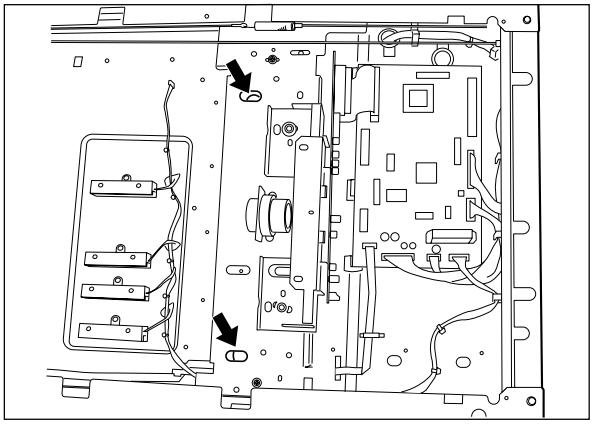
(3) Disconnect 1 connector and remove 2 screws to take off the laser fan motor.



[B] Laser optical unit

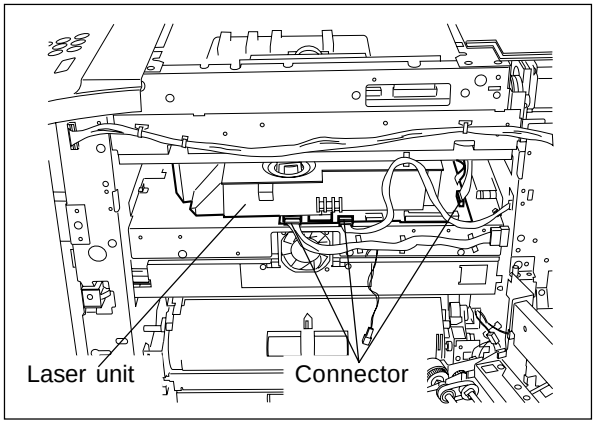
(1) Remove the original glass and lens cover. (► Chap.6)

(2) Loosen 2 laser unit setscrews.



(3) Remove the laser fan motor.

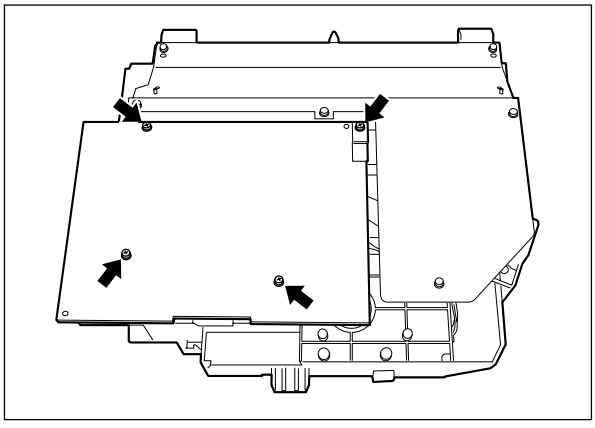
(4) Disconnect 3 connectors and pull out the laser unit.



[C] Laser unit PC board

(1) Remove the laser unit.

(2) Disconnect 5 connectors and remove 4 screws to take off the laser unit PC board.



Notes: 1. Do not leave fingerprints or stain on the slit glass.

2. Pay close attention not to make an impact or vibration on the laser optical unit since it is a precise apparatus.

3. The laser optical unit, which has been removed, should be placed on the poligonal motor without loading on it.

4. Do not disassemble the laser optical unit in the field since it is precisely adjusted and very sensitive to dust and stain.

9. PAPER FEEDING SYSTEM

9. 1. General Description
9. 2. Functions
9. 3. Operation
9. 3. 1. Operation of bypass pickup roller
9. 3. 2. Operation of cassette pickup roller
9. 3. 3. Paper separation
9. 3. 4. General operation
9. 4. Drive Circuit for Tray-up Motor
9. 5. Disassembly and Replacement

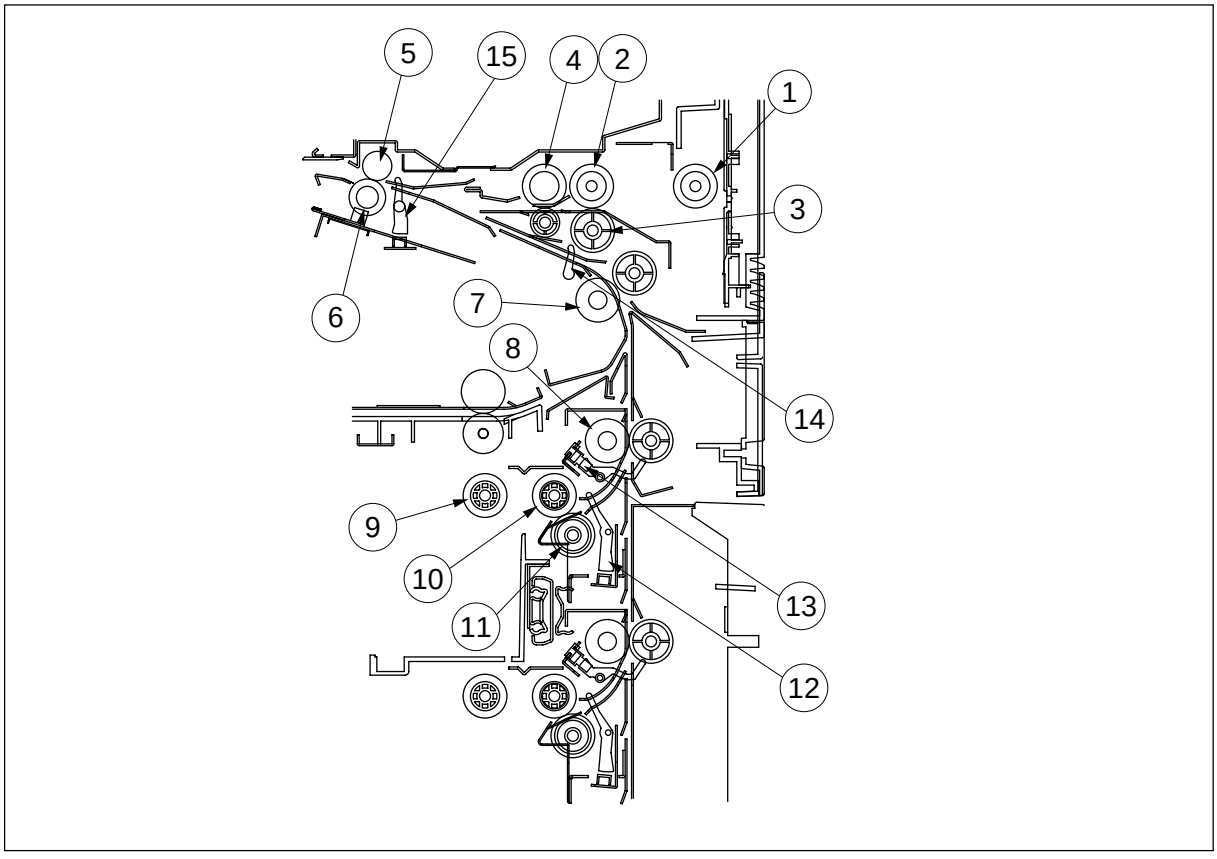
9. PAPER FEEDING SYSTEM

9. 1. General Description

The paper feeding system is for transporting paper set on the cassette, bypass tray and tandem LCF to the transfer section.

The clutch controls to convey the motor drive to each roller, and each sensor detects the transporting state of the paper.

9. 2. Functions



Paper feeding system sectional view (Front side)

No.	Name	No.	Name
1	Bypass pickup roller	9	Cassette pickup roller
2	Bypass feed roller	10	Cassette feed roller
3	Bypass separation roller	11	Cassette separation roller
4	Bypass transport roller	12	Cassette feed sensor
5	Registration roller (metal)	13	Cassette transport sensor
6	Registration roller (rubber)	14	Intermediate transport sensor
7	Intermediate transport roller	15	Registration sensor
8	Transport roller	—	

(1) Pickup roller

These rollers draw out paper from the bypass tray, cassette or tandem LCF and send it to the feed roller.

(2) Feed roller

This roller is placed against the separation roller. It transports paper from the pickup roller to the transport roller.

(3) Separation roller

This roller is placed against the feed roller. When two or more sheets of paper are sent from the pickup roller, the load of the torque limiter of the separation roller is greater than the frictional force between the sheets of paper. As the result, the separation roller is stopped and the lower paper is not advanced any further. When only one sheet of paper is sent from the pickup roller, the separation roller rotates following the feed roller.

(4) Transport roller

This roller transports the paper sent from the feed roller to the registration roller.

(5) Registration roller

The paper sent from the transport roller is pushed against the registration roller which aligns ths leading edge of paper. Then the registration roller rotates to transport the paper to the transfer section.

(6) Bypass feed sensor

This sensor detects if paper is set in the bypass tray. If it is, bypass feeding always comes before cassette feeding.

(7) Cassette empty sensor

This is an emission type sensor and detects the availability of paper in the cassette by using an actuator. When there is no paper in the cassette, the actuator blocks the light path of the sensor, and the sensor determines that there is no paper.

(8) Feed sensor, Transport sensor

Feed sensor detects if the leading edge or trailing edge of paper passed the feed roller. Transport sensor detects if the leading edge or trailing edge of paper passed the transport roller. They also detects jams like misfeeding.

(9) Registration sensor

This sensor detects that the leading edge of paper has reached the registration roller and the trailing edge of paper has passed the registration roller.

(10) Tray-up sensor

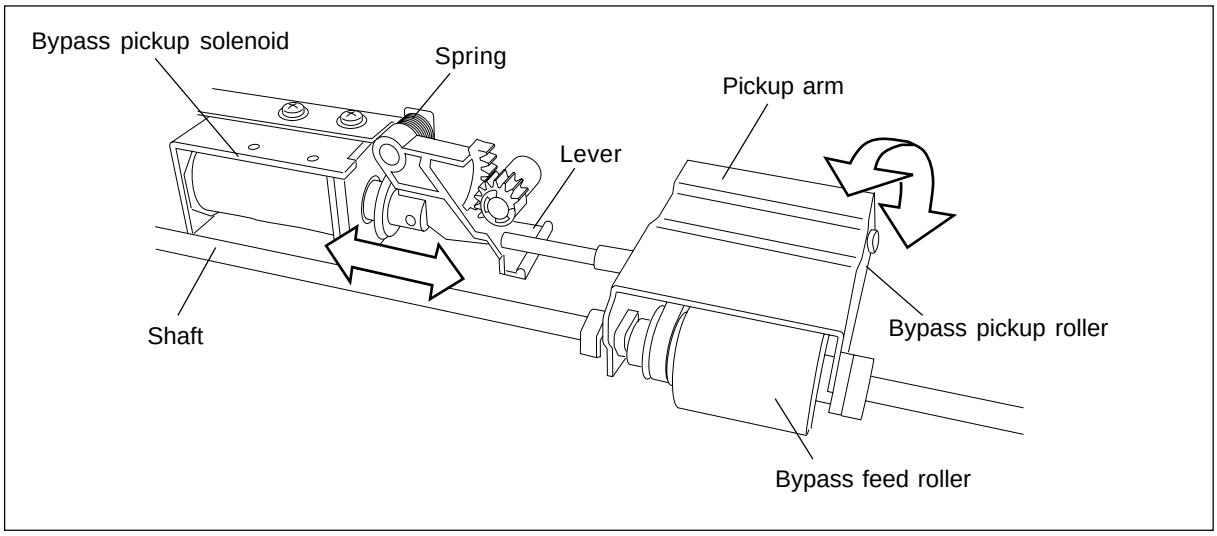
This sensor detects the tray position when the trays of the cassette and tandem LCF go up.

(11) Bottom sensor

This sensor detects the tray bottom position of the cassette and tandem LCF.

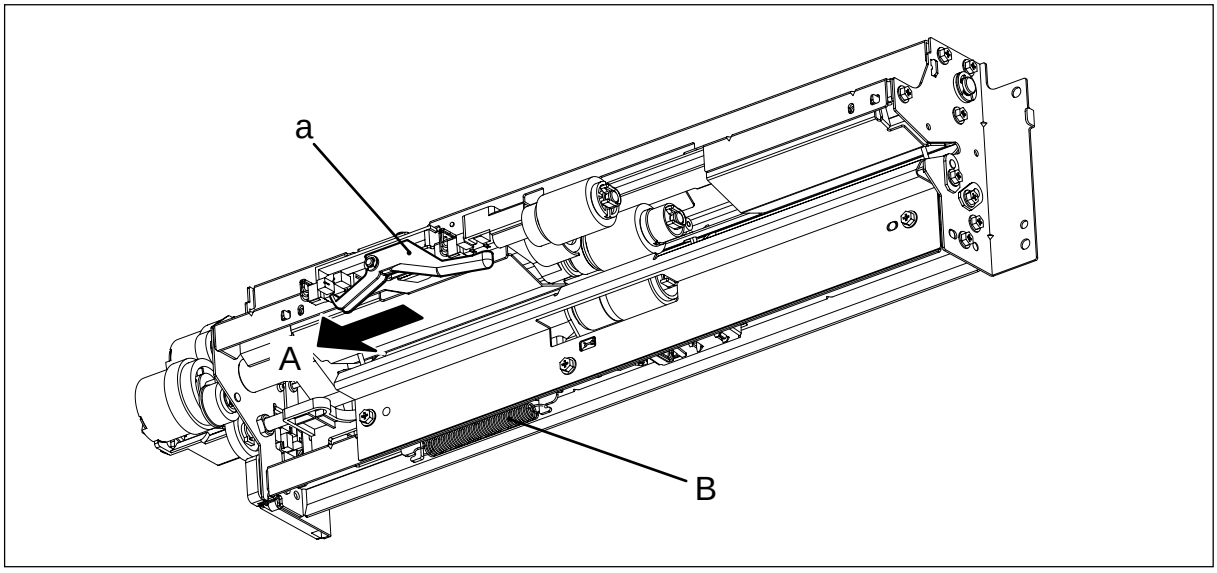
9. 3. Operation

9. 3. 1. Operation of bypass pickup roller



When the bypass pickup solenoid is turned ON, the plunger is pulled and the lever is revolved and brought down. The pickup arm, which is linked with the lever, is also brought with the lever by its own weight. When the bypass pickup solenoid is turned OFF, the pickup arm is brought up by the spring force.
The driving force transmitted through the bypass feed clutch is also transmitted to the bypass feed roller through the shaft and then to the bypass pickup roller through the timing belt. The roller is rotated by this driving force.

9. 3. 2. Operation of cassette pickup roller



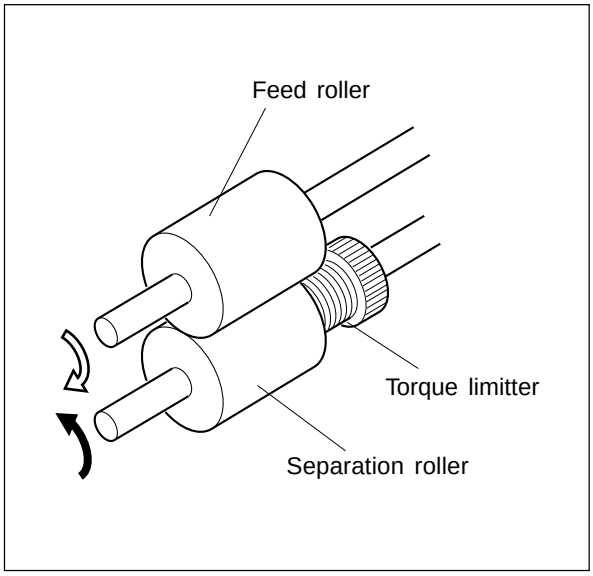
When the cassette is inserted, the protrusion at the rear side of the cassette pushes the lever (a) to the direction of A. Then the pickup roller and roller holder are lowered by the spring force of (B).

9. 3. 3. Paper separation

This model is equipped with a separation roller which works to prevent multiple paper feeding. The separation roller unit consists of the feed roller, separation roller, torque limitter, etc., as shown at right.

The feed roller is rotated by the feed clutch in the direction of the arrow (↷) at the same timing as the pick-up roller rotation.

The figure at lower right shows how duplicate feeding is prevented: Since the friction between two sheets is small, the lower sheet is not transported any further while the upper sheet is transported by the feed roller in the direction of the arrow (⬅).

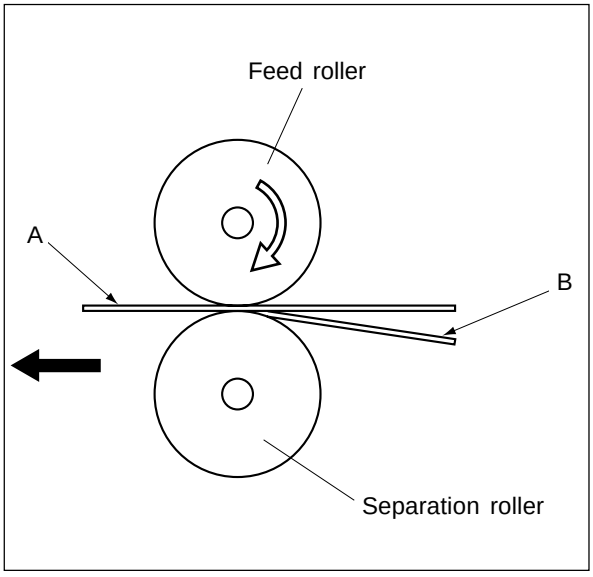


[Example]

When only one sheet enters between the rollers: Since the transporting force of the feed roller is greater than the braking force of the separation roller, the separation roller follows the feed roller, making the sheet go forward to the registration roller.

When two sheets enter between the rollers at the same time:

Since the transporting force of the feed roller and the breaking force of the separation roller are greater than the frictional force between two sheets, the paper A is transported to the direction of the arrow (⬅) and the paper B is braked by the separation roller and is not transported any further.



9. 3. 4. General operation

[A] From power ON to standby status

(1) When the copier is turned ON, the tray-up motor is activated and 1st cassette tray starts to rise. When the tray-up sensor is turned ON (H → L), the tray-up motor is turned OFF and the tray is stopped. At this time, if the empty sensor is OFF (L), it is judged that there is no paper in the cassette. With the empty sensor being ON (H), there is paper in the cassette. The tray stops at the raised position regardless of availabilty of paper.

Then the tray-up motor starts to rotate in reverse and 2nd cassette starts to be lifted. 2nd cassette tray is stopped in the same manner as 1st cassette tray and the empty sensor detects if there is paper in the cassette.

(2) When the cassette is not completely inserted when the copier is turned ON, the tray for that cassette is not raised. When the cassette is inserted completely, the tray is raised and checks the availability of the paper.

(3) When either of the sensors at the transport path is ON (meaning there is paper on the transport path) when the copier is turned ON, it is determined that a paper jam has occurred and no operation is enabled until the paper is removed.

[B] Standby status

(1) After the tray is moved up and availability of paper is checked as described above, the copier enters the standby state. In the standby mode, the tray remains at raised position.

(2) When a cassette is inserted or removed in the standby state, the tray is raised again to check the availability of paper.

[C] Bypass feeding

- The bypass sensor detects the availability of paper.
- The bypass feed clutch is turned ON and the bypass pickup roller and bypass feed roller rotate.
- The bypass pickup solenoid is turned ON and the bypass pickup roller is lowered to start feeding.
- The leading edge of the paper turns ON the registration sensor and the paper is aligned with the registration roller.
- The bypass feed clutch is turned OFF and the bypass pickup roller and the bypass feed roller are stopped, and then the bypass pickup roller is raised.
- The registration motor is turned ON and paper is transported to the transfer unit.

[D] Cassette feeding

- The feed clutch is turned ON and the pickup roller and feed roller rotate to start feeding.
- The leading edge of paper turns ON the transport sensor, the feed clutch is turned OFF and the transport clutch is turned ON.
- The leading edge of paper turns ON the registration sensor and paper is aligned with the registration roller.
- The transport clutch is turned OFF and the transport roller is stopped.
- The registration motor and transport clutch are turned ON and paper is transported to the transfer unit.

[E] Tandem LCF

(E-1) From power ON to standby status

(1) When the copier is turned ON, the power is supplied to start the pre-running operation. The tandem LCF tray-up motor starts to rotate forward and raises the tray. The tandem LCF tray-up motor is turned OFF when the tray turns ON the tandem LCF tray-up sensor, and the tray is then stopped. At this time, it is judged whether there is paper on the feed side tray when the tandem LCF empty sensor is ON. On the other hand, the absence of paper on the feed side tray is assumed when the sensor is OFF, and the tandem LCF standby side empty sensor is subsequently checked. When the tandem LCF standby side empty sensor is OFF, paper is absent on the standby side tray and it is therefore assumed that there is no paper in the tandem LCF. When the tandem LCF standby side empty sensor is ON, paper on the standby side tray is moved onto the feed side tray. The tandem LCF tray-up motor is rotated in reverse and lowers the feed side tray. The tray lowered turns ON the tandem LCF tray bottom sensor, and the tandem LCF tray-up motor is turned OFF to stop the tray. The end fence solenoid and pickup solenoid are then turned ON. The end fence motor rotates forward and the paper on the standby side tray is moved onto the feed side tray. The end fence motor is stopped for a second when the end fence stop position sensor is turned ON, and the motor immediately starts to rotate in reverse to return the end fence to the position where the end fence home position sensor is turned ON. When the returning operation is started, the end fence solenoid and pickup solenoid are turned OFF, and the tandem LCF tray-up motor is rotated forward to raise the tray. The tandem LCF tray-up motor is turned OFF when the tray being raised turns ON the tandem LCF tray-up sensor and stops the tray. At this time, the presence of paper is judged when the tandem LCF empty sensor is ON.

(2) Whe the power is turned ON after the tray unit is removed, the tandem LCF tray-up motor for that tray is not turned ON. The tray is raised as soon as the tray unit detects that there is paper on the tray.

(3) When either of the tandem LCF feed sensors is ON (there is paper at the transportation path) in turning ON the power, a paper jam is occuring and the operation is disabled until the paper is removed.

(E-2) Standby status

(1) Trays detect the paper as described above, and the copier goes into the standby status.
(2) The tray goes down automatically when the tray unit is removed and is raised as soon as the tray unit is reinstalled it then checks if there is paper in the tray.

(E-3) From the start to the end of copying

(1) The drum motor of the copier is turned ON when the [START] key is pressed. The transport motor is turned ON to drive.
(2) When the copier judges that the tandem LCF is ready for feeding paper, it turns ON the tandem LCF feed clutch of the selected tray. This clutch drives the pickup roller and feed roller to feed paper from the tray.
(3) In a specified time after the feeding has started, the tandem LCF transport clutch is turned ON to drive the transport roller.
(4) The leading edge of the paper turns the feed sensor ON. These are located right next to the exit side of the selected tray. The tandem LCF feed clutch is turned OFF and feeding from the tray is completed.
(5) The paper is transported to the copier by the tandem LCF transport roller. If the trailing edge of the previously sent sheet still remains at the feed sensor when the leading edge of the paper reaches the feed sensor, the tandem LCF transport clutch is turned OFF to stop the transport of the paper.
(6) The trailing edge of the paper turns the feed sensor OFF. These are located right next to the exit side of the selected tray. The tandem LCF then becomes ready for feeding the next sheet of paper, and the procedures (2) to (5) are repeated.
(7) When the copying operation is completed, the drum motor, the tandem LCF transport motor and transport clutch are turned OFF and the transport roller is stopped.

(E-4) Error detection

a) Jam detection

(1) A paper jam occurs in the following cases.
    a. Feed sensor is not turned ON within a specified time after the feeding has started.
    b. The leading edge of the paper does not pass the feed sensor in the transport path within a fixed time.
(2) Open the feed side lower cover and remove all the paper remaining on the transport path and close the cover to clear the jammed paper. If either of the feed sensors is still ON when the cover is closed, it is determined that there is still paper on the transport path and the paper jam status is not canceled.
(3) When a paper jam occurs in the paper feeder during multiple copying, the sheet that was fed before the jam is copied normally.

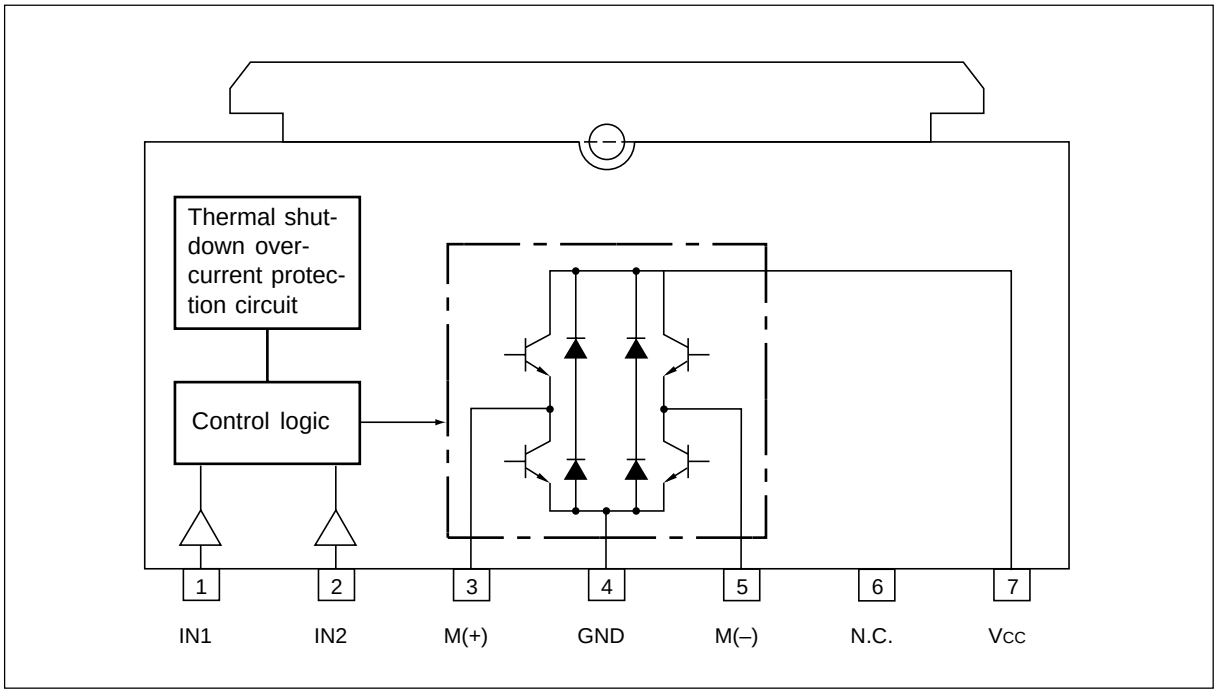
b) Call for service

(1) When the tandem LCF tray-up sensor is not turned ON even through a specified time has passed since the tray started to be raised, it is assumed that the tray cannot be used (there is no paper) and the corresponding message is displayed on the control panel.
(2) When the tandem LCF tray bottom sensor is not turned ON even through a specified time has passed since the tray started to be lowered, it is assumed that the tray cannot be used (there is no paper) and the corresponding message is displayed on the control panel.
(3) When the end fence stop position sensor is not turned ON even through a specified time has passed since the end fence started to move the paper in the standby side tray, it is assumed that the tray cannot be used (there is no paper) and the corresponding message is displayed on the control panel.
(4) When the end fence home position sensor is not turned ON even through a specified time has passed since the end fence started to move the paper in the standby side, it is assumed that the tray cannot be used (there is no paper) and the corresponding message is displayed on the control panel.
(5) The states (1) to (4) are cleared by removing the tray unit.

9. 4. Drive Circuit for Tray-up Motor

Cassette tray-up motor (MOT) : Driven by IC72 (tray-up motor 1) and IC36 (tray-up motor 2) (LGC: TA8428)

Block diagram of TA8428



IN1 and IN2 are input terminals to receive the signals from the microcomputer. The control logic, based on the signals from the microcomputer, controls the rotation direction and ON/OFF of the motor.

Input		Output		Remarks
IN1	IN2	M (+)	M (–)	
H	H	L	L	BRAKE
L	H	L	H	CW
H	L	H	L	CCW
L	L	OFF (high impedance)		STOP

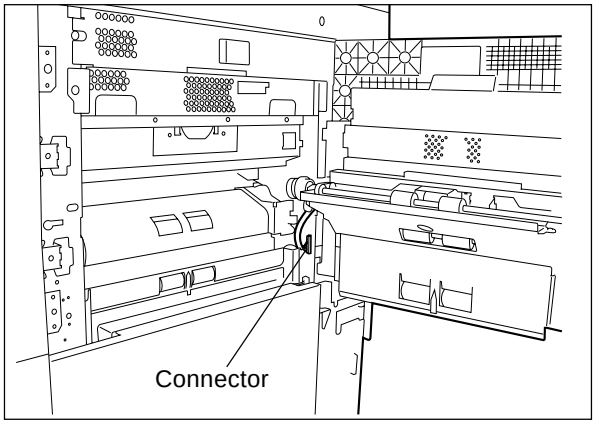
9. 5. Disassembly and Replacement

[A] Feed unit

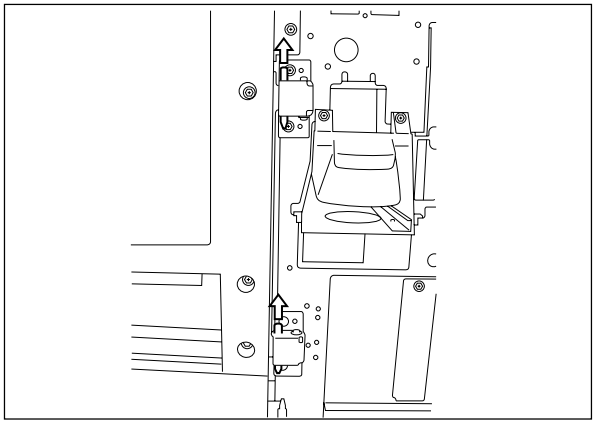
(A-1) Pickup roller/Feed roller/Separation roller

(1) Remove the feed side rear cover.

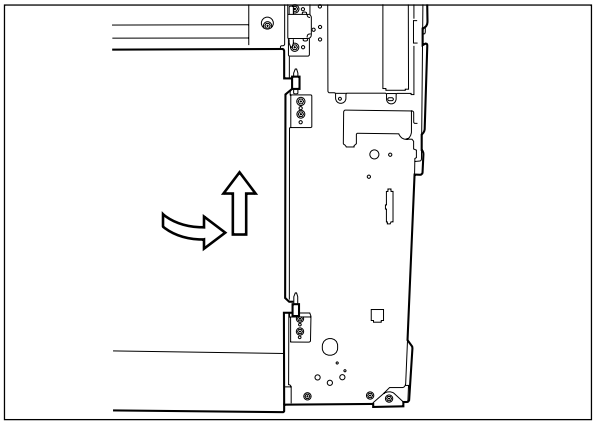
(2) Open the feed side center cover and disconnect 1 connector.



(3) Remove 2 pins and lift the bypass feed unit with the feed side center cover to take off.



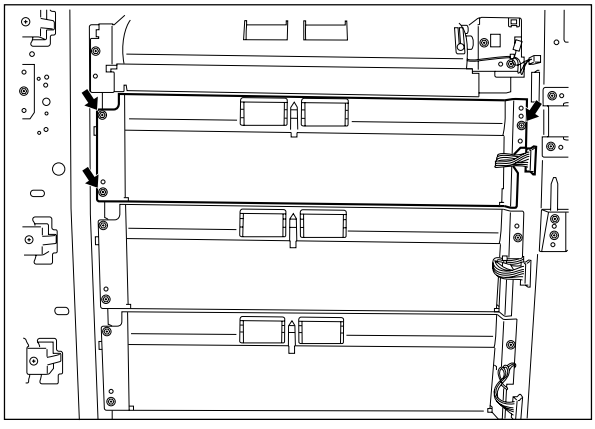
(4) Open the feed side bottom cover and lift it to take off.



(5) Pull out the cassette or tandem LCF completely.

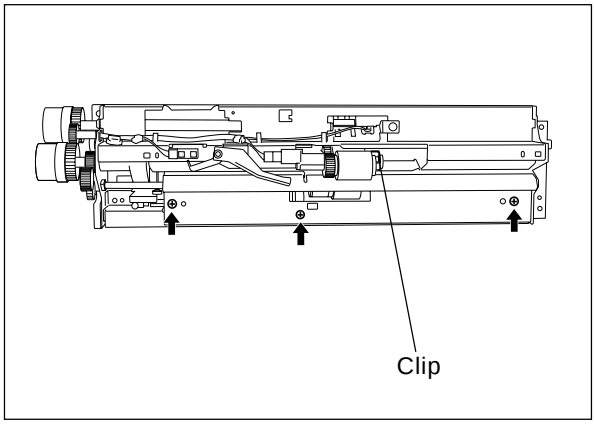
Note: With failing that, sensors may be damaged.

(6) Disconnect 1 connector, remove 3 screws and take off the feed unit.



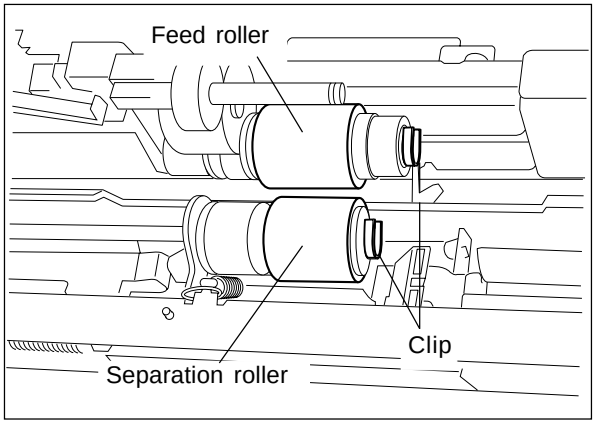
(7) Remove 1 clip and take off the pickup roller.

(8) Remove 3 screws and take off the guide.



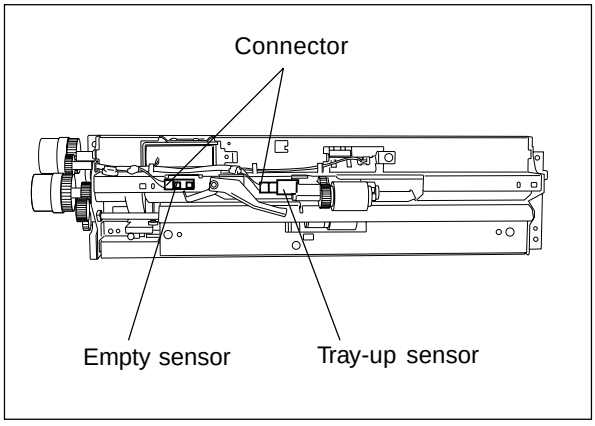
(9) Remove 1 clip and take off the feed roller.

(10) Remove 1 clip and take off the separation roller.

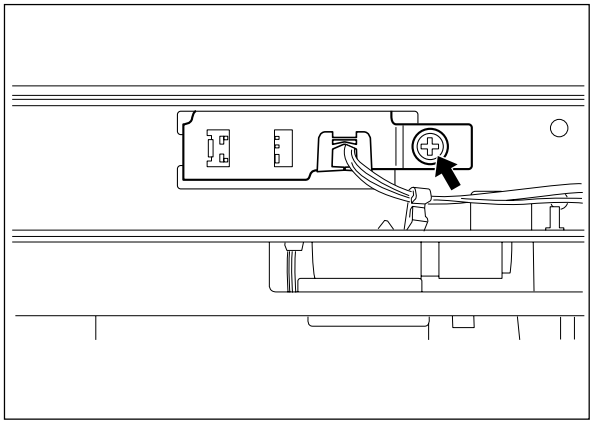


(A-2) Empty sensor/Tray-up sensor/Transport sensor

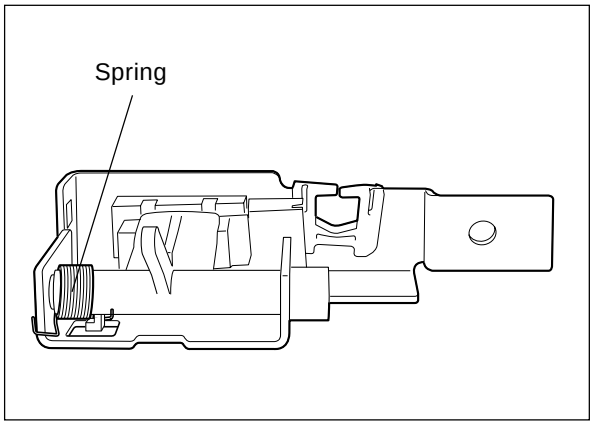
(1) Disconnect 1 connector and take off the empty/ tray-up sensors.

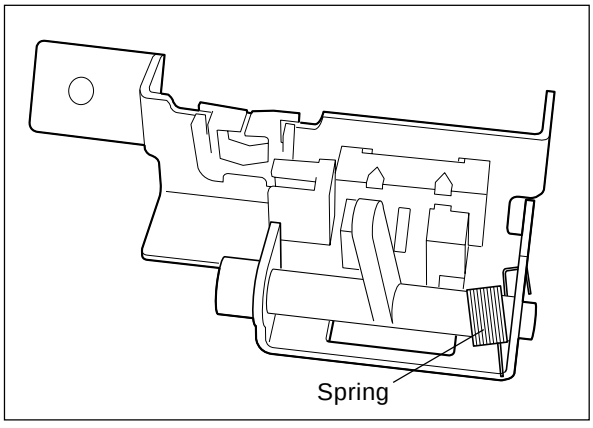


(2) Disconnect 1 connector, remove 1 screw and take off the transport sensor.



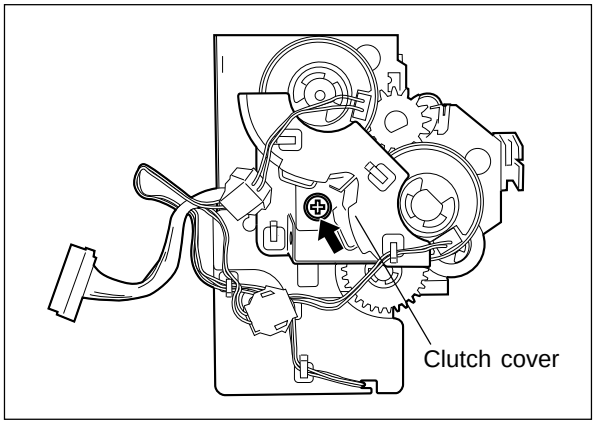
Note: Make sure to put on the spring properly after replacing the sensors.



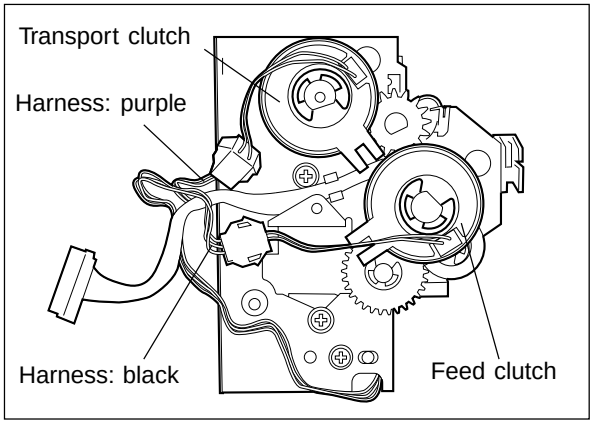


(A-3) Feed clutch/Transport clutch

(1) Release the harness from the harness clamp. Then remove 1 screw and take off the clutch cover.

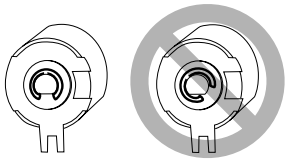


(2) Disconnect 1 connector, remove 1 E-ring for each clutch and take off the feed and transport clutches.



Notes: 1. When installing the clutches, pay attention to the color of harness and fit the stoppers on them completely.

2. Make sure that the E-rings are tightly fit not to be loosen and one end of E-ring does not ride too much on the flat part of shaft.

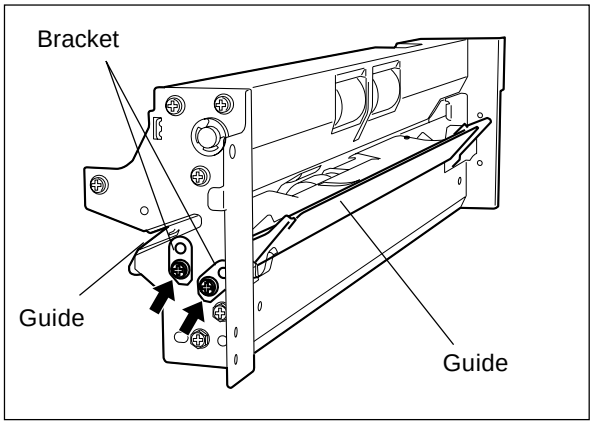


(A-4) Pickup solenoid

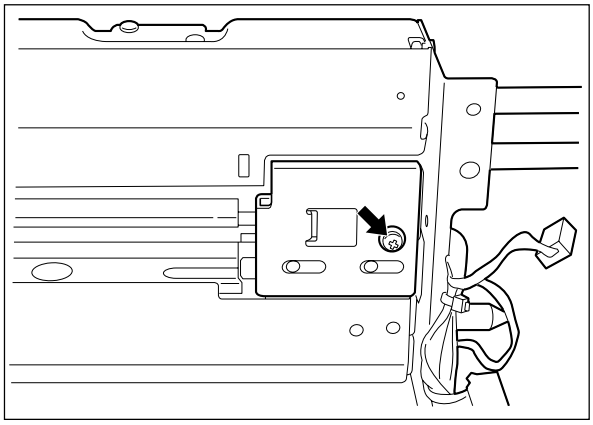
(1) Remove the feed unit for the tandem LCF.

(2) Release the feed clutch and transport clutch.

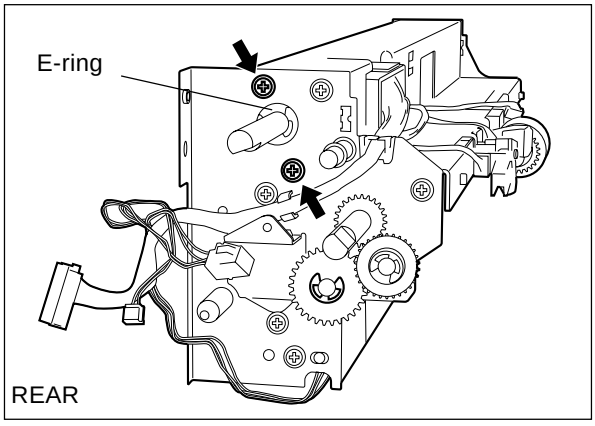
(3) Remove 2 screws and take off 2 brackets and 2 guides.

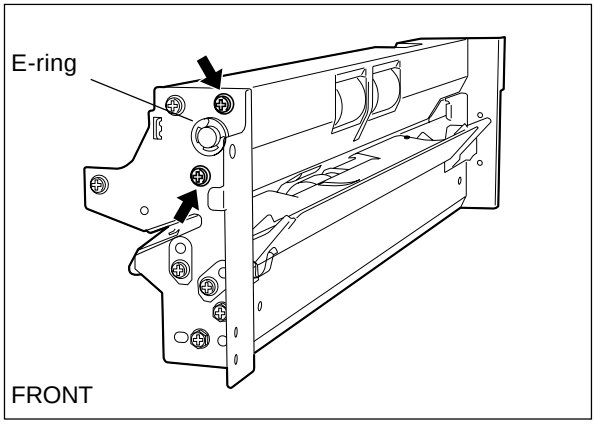


(4) Remove 1 screw and take off the bracket.

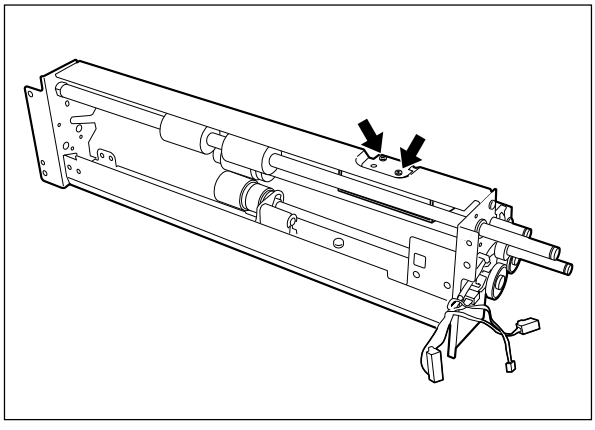


(5) Remove 4 screws (2 in the front and 2 in the rear side) and take off the guide.
Remove 2 E-rings (1 in the front and 1 in the rear side) and take off the transport roller.



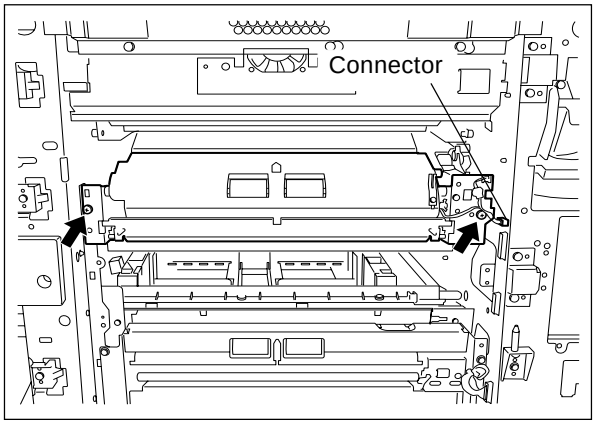


(6) Disconnect 1 connector, remove 2 screw and take off the solenoid.

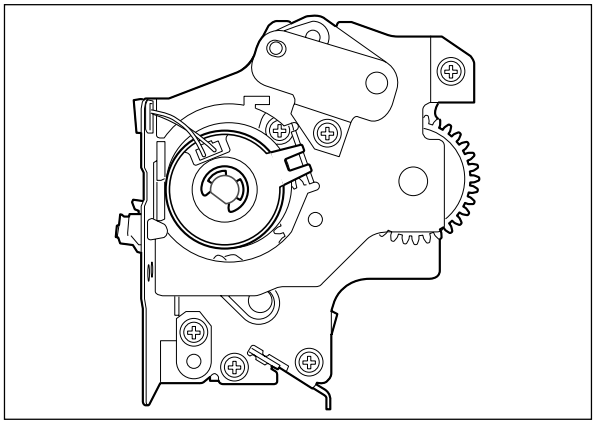


[B] Transport unit

(1) Disconnect 1 connector and remove 2 screws to take off the transport unit.

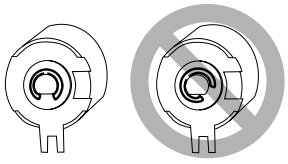


(2) Remove 1 E-ring, disconnect 1 connector and release the intermediate transport clutch.



Note: 1.When installing the clutch, fit the stopper on it completely.

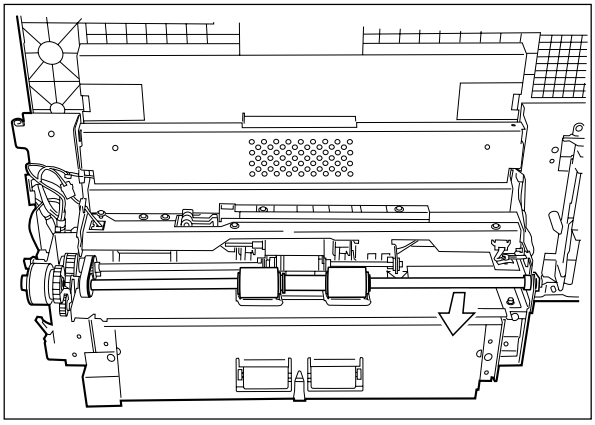
2.Make sure that the E-rings are tightly fit not to be loosen and one end of E-ring does not ride too much on the flat part of shaft.



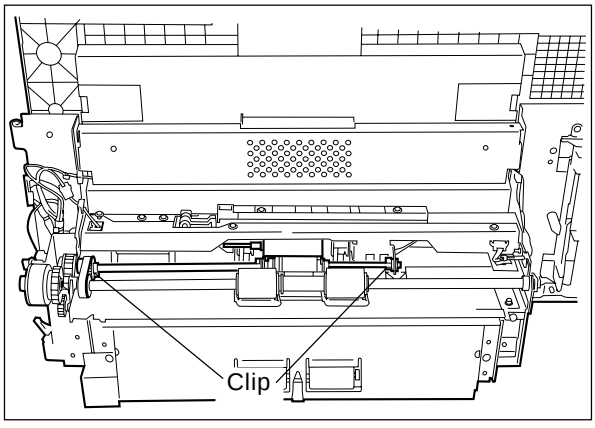
[C] Bypass feed unit

(1) Remove the bypass feed unit.

(2) Remove 1 clip and 1 bushing and displace the bypass transport roller.



(3) Remove 2 clips and 1 bushing and take off the pickup/feed roller unit.

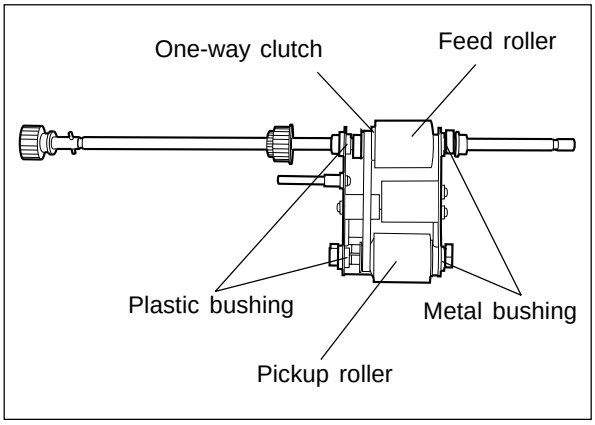


(4) Remove 3 clips and take off the pickup roller.

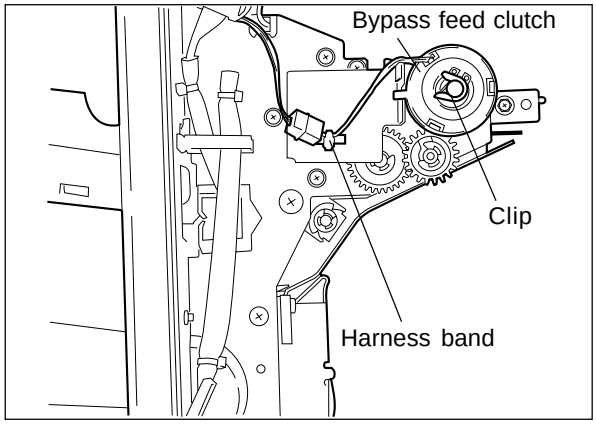
(5) Remove 3 clips and take off the feed roller.

Notes: 1. When installing the rollers, be careful not to use the bushing of a wrong material.

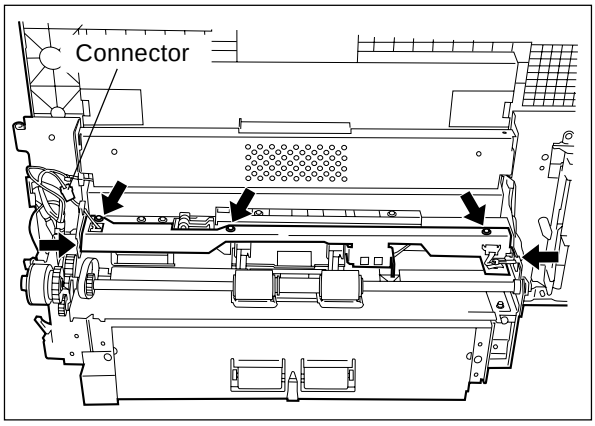
2. Install the feed roller for the one-way clutch to come to the rear side.



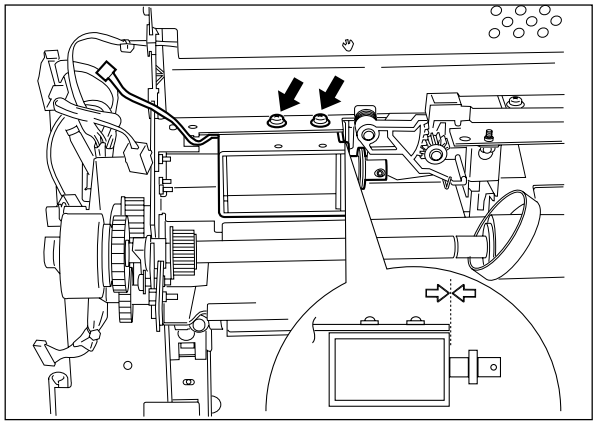
(6) Remove 1 clip, disconnect 1 connector, take off 1 harness band and release the bypass feed clutch.



(7) Remove 5 screws, disconnect 1 connector and take off the stay.

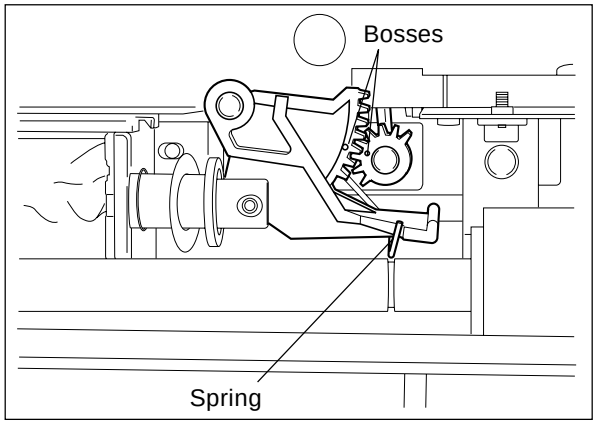


(8) Disconnect 1 connector and remove 2 screws to take off the solenoid.

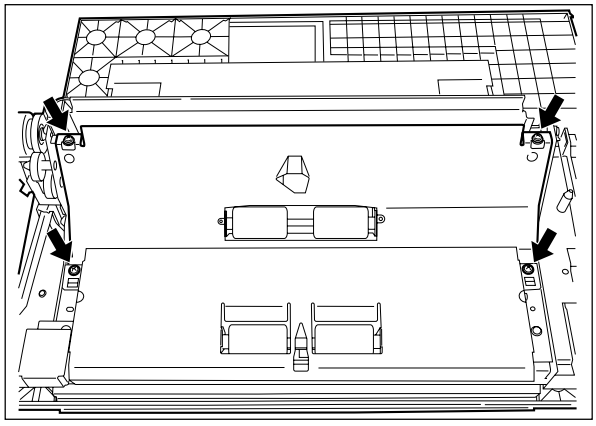


Notes: 1. When installing the solenoid, install it for the edge of the solenoid to get in phase with the edges of the plate.

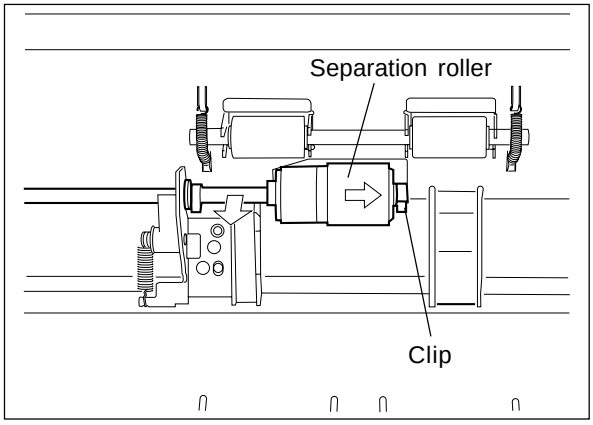
2. When installing the solenoid, fix it at the position where the bosses of two gears are put each other.
3. Put on the spring in the place shown by the figure.



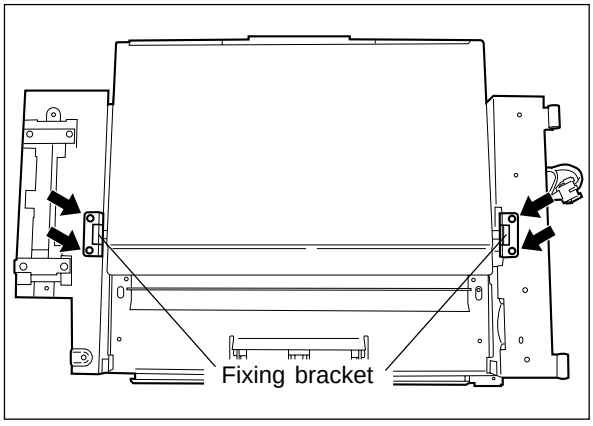
(9) Remove 4 screws and take off the guide.



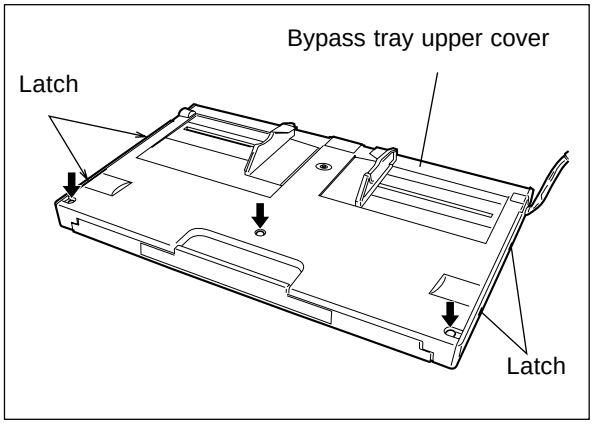
(10) Remove 1 clip, displace the shaft and take off the separation roller.



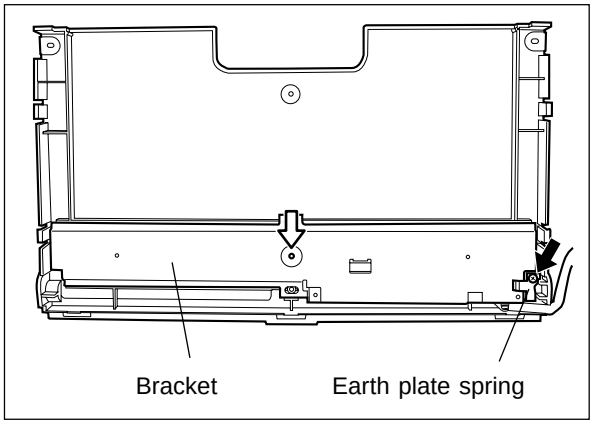
(11) Remove 2 screws for each bracket and release 2 fixing brackets. Then take off the bypass tray.



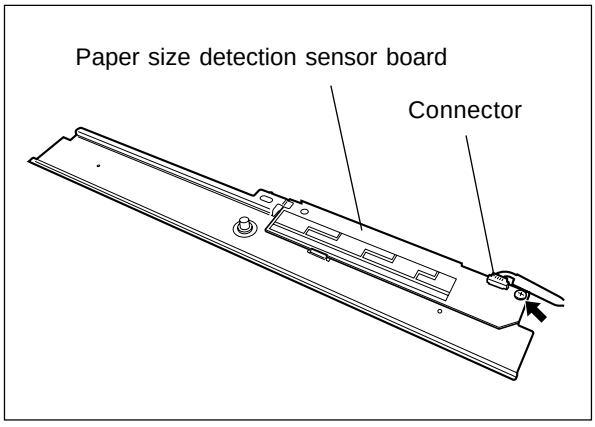
(12) Remove 3 screws, release 4 latches and take off the bypass tray upper cover.



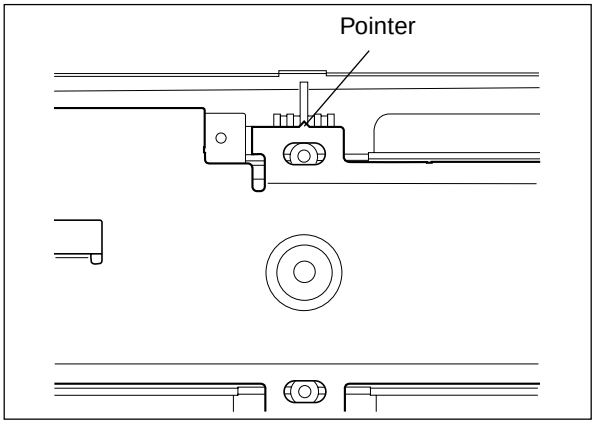
(13) Remove 1 screw and take off the plate spring.
(14) Remove 1 screw (as shown with the white arrow) from the back side and release the bracket.



(15) Disconnect 1 connector, remove 1 screw and take off the paper size detection sensor board.

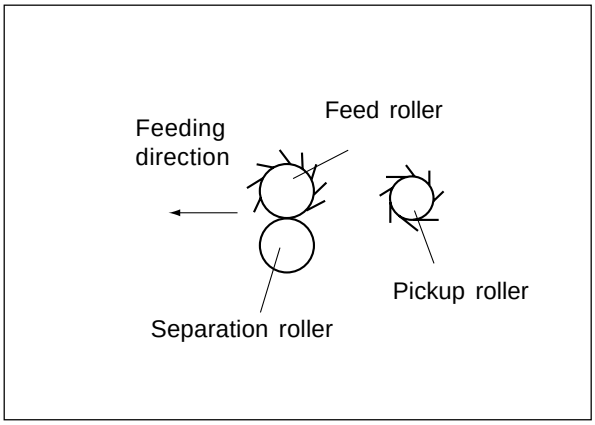


Note: When installing the bracket, install it so that the pointer of the bracket comes to the position where it has been before being removed.



Notes: Pay attention to the following things when setting up the bypass feed roller and pickup roller.

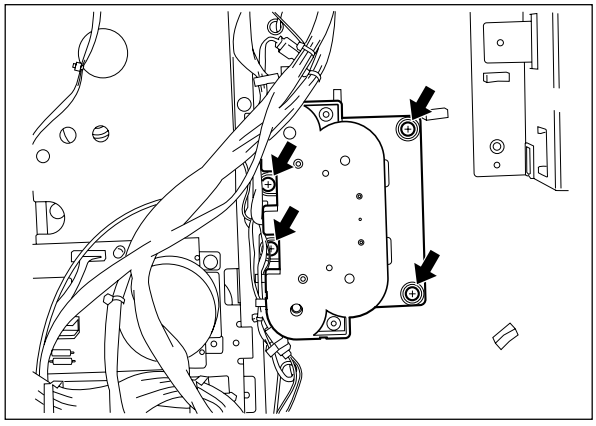
1. Put the clip in the groove of the shaft completely.
2. Make sure there is no adhesion of oil and such on the timing belt, pulley and roller.
3. Be careful not to install the bypass pickup roller and feed roller in a wrong direction.
4. Install the feed roller for the one-way clutch to come to the rear side.



[D] Tray drive unit

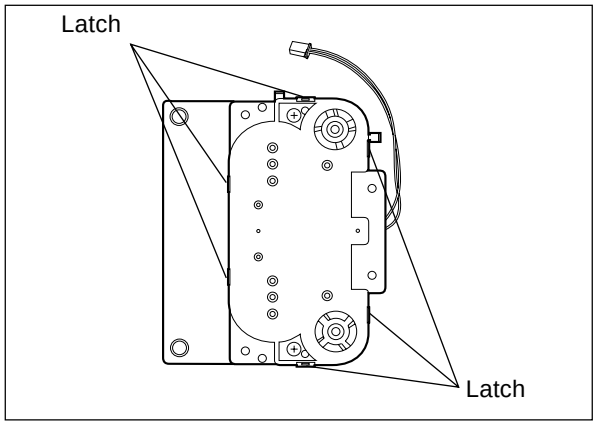
(1) Remove the rear cover and take off the power supply unit.

(2) Remove 4 screws and take off the tray drive unit.



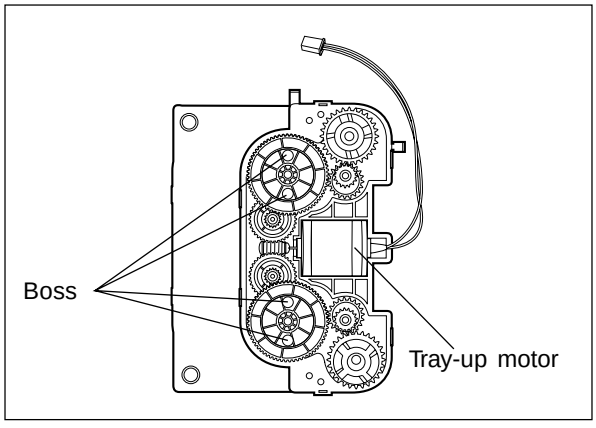
(3) Turn over the tray drive unit. Then release 6 latches and take off the cover.

Note: Since the spring inside the tray drive unit is forcing the cover to extend, be careful when taking off the cover.



(4) Remove the tray-up motor.

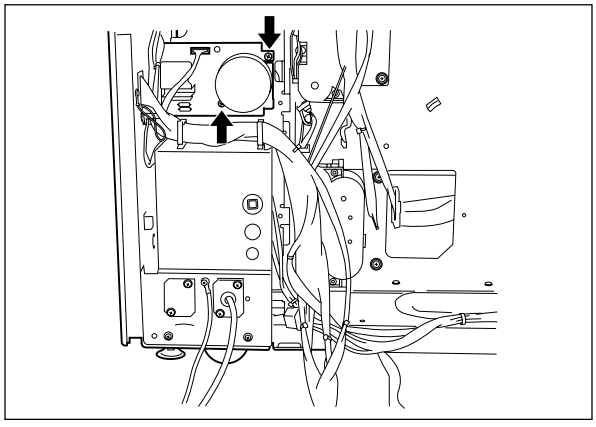
Note: Make sure the bosses of the gear fit into the hole of the cover when installing the unit.



[E] Feed motor

(1) Remove the rear cover.

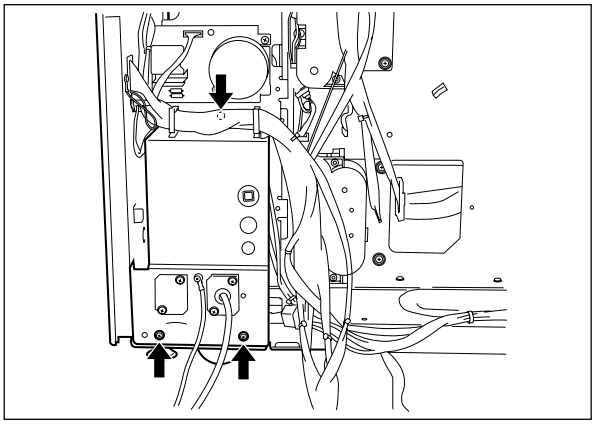
(2) Disconnect 1 connector, remove 2 screws and take off the feed motor.



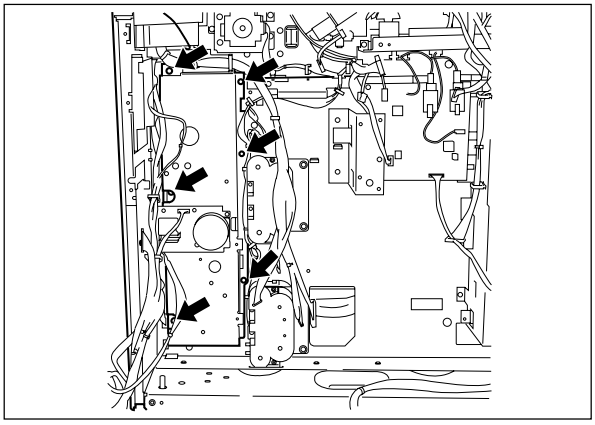
[F] Feed drive unit

(1) Remove the power supply unit.

(2) Remove 3 screws and take off the power cable connecting section.



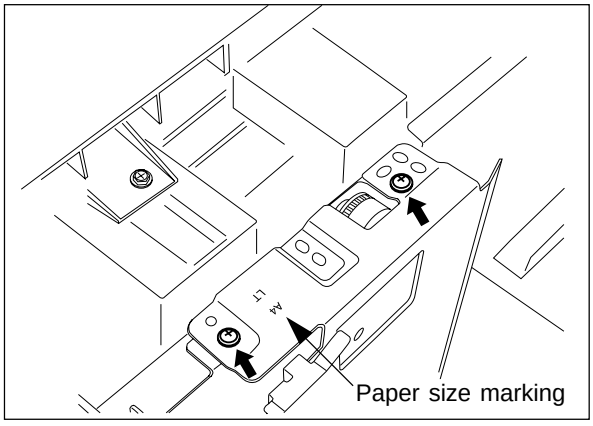
(3) Remove 6 screws and take off the feed drive unit.

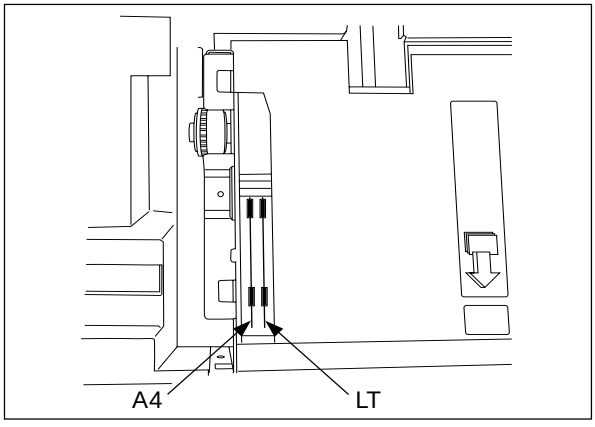


[G] Tandem LCF

(G-1) Feed side front guide

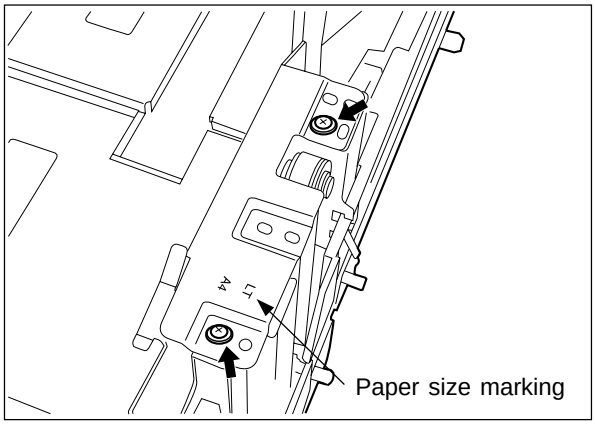
(1) Remove 2 screws fixing the feed side front guide.
(2) Lift the paper guide a little and insert it in the groove of the paper size marking. Then tighten up the screw after confirming the screw hole position.

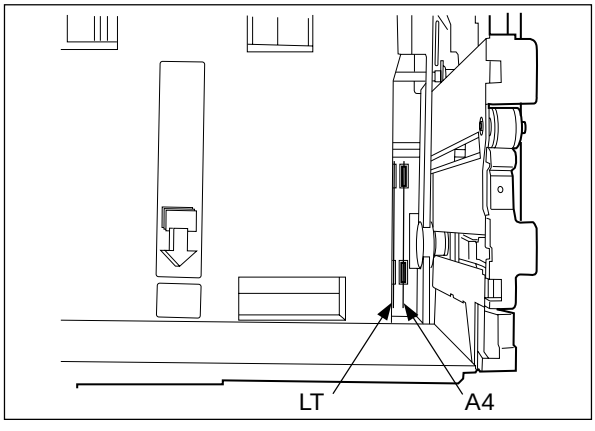




(G-2) Feed side rear guide

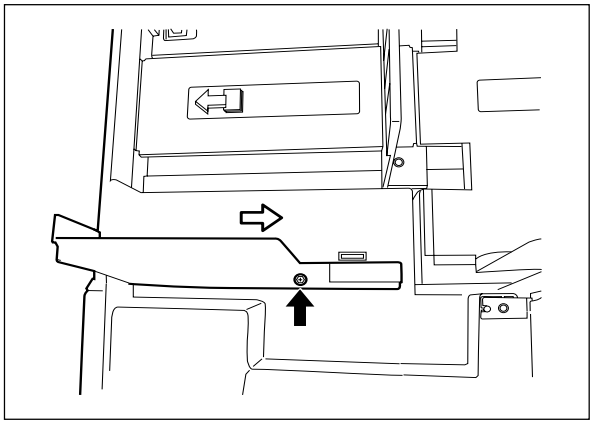
(1) Remove 2 screws fixing the feed side rear guide.
(2) Lift the paper guide a little and insert it in the groove of the paper size marking. Then tighten up the screw after confirming the screw hole position.

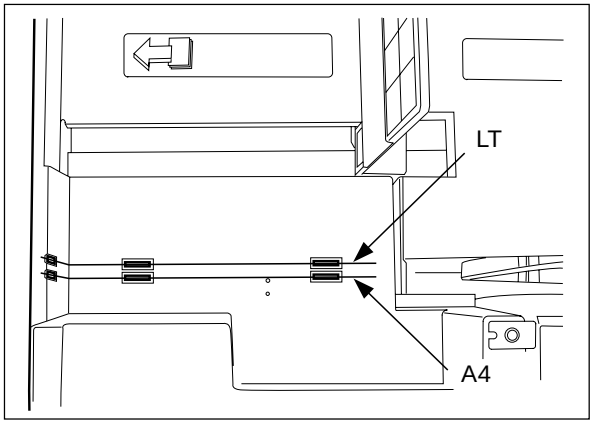




(G-3) Standby side front guide

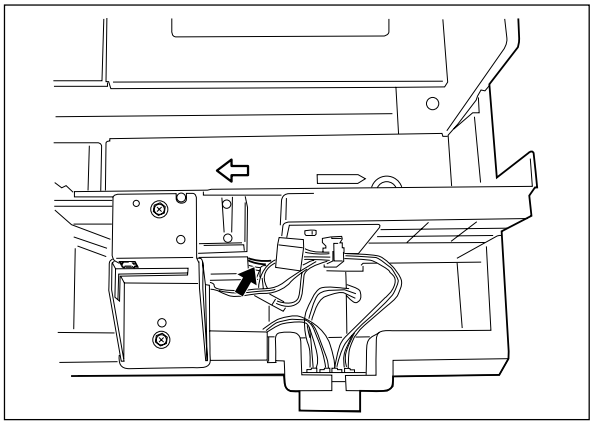
(1) Remove 1 screw fixing the standby side front guide and move the guide toward the direction of the white arrow.
(2) Lift the paper guide a little and insert it in the groove of the paper size marking. Then tighten up the screw after confirming the screw hole position.

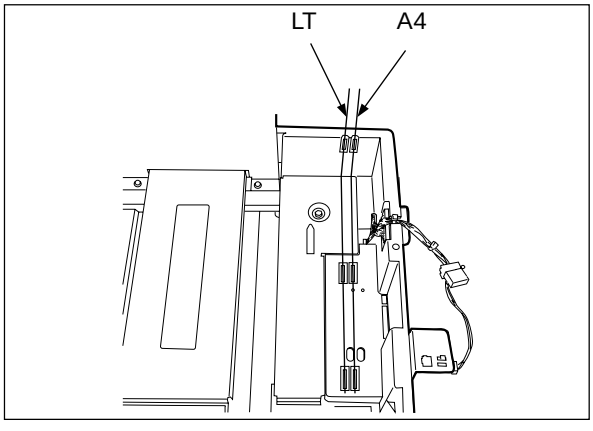




(G-4) Standby side rear guide

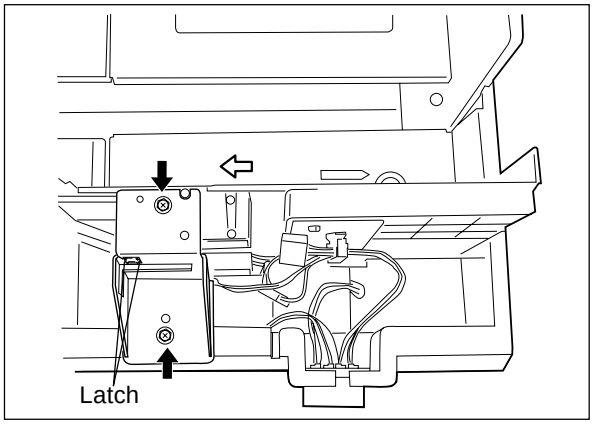
(1) Remove 1 screw fixing the standby side rear guide and move the guide toward the direction of the white arrow.
(2) Lift the paper guide a little and insert it in the groove of the paper size marking. Then tighten up the screw after confirming the screw hole position.





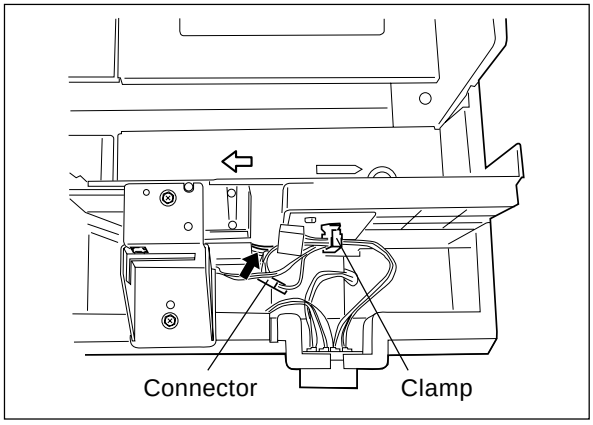
(G-5) Standby side paper mis-stacking detection sensor

(1) Remove 2 screws and release the sensor bracket.
(2) Disconnect 1 connector.
(3) Release the latches and take off the sensor.

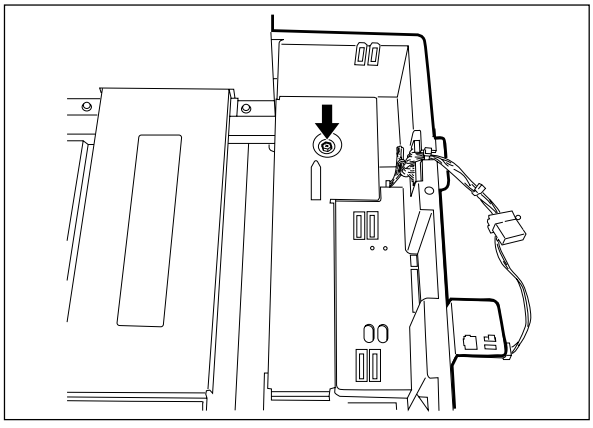


(G-6) End fence home position sensor/Standby side empty sensor

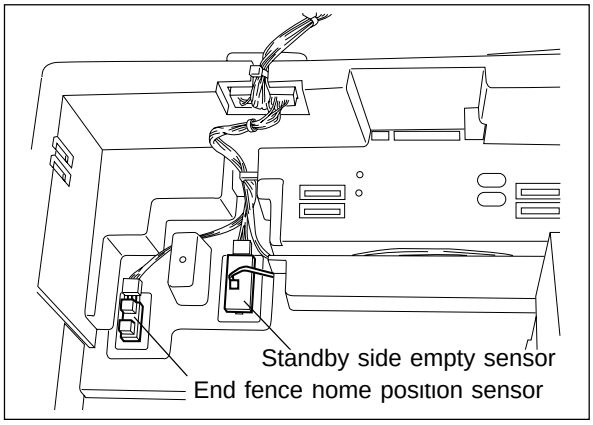
(1) Disconnect 1 connector and release the harness from the clamp.
(2) Remove 1 screw fixing the standby side rear guide. Then move the guide toward the direction of the white arrow and take it off.



(3) Remove 1 screw and release the bracket.

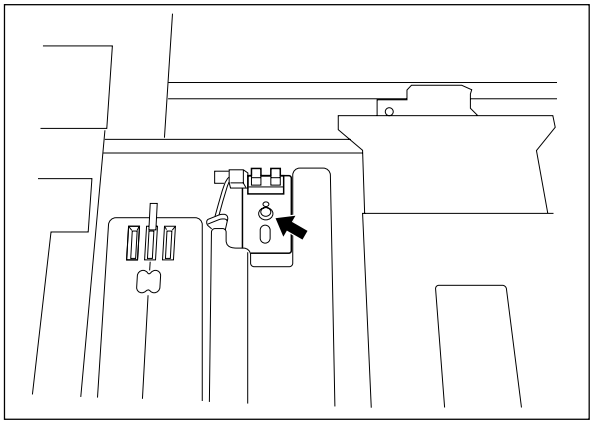


(4) Disconnect the connector.
(5) Release the latches from the back side of the tandem LCF cassette, and take off the end fence home position sensor and standby side empty sensor.

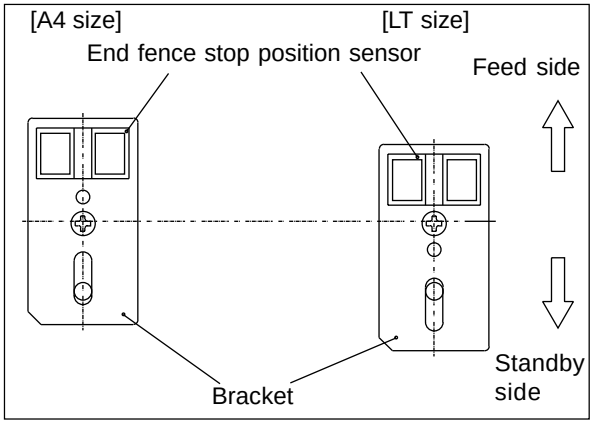


(G-7) End fence stop position sensor

(1) Disconnect 1 connector, remove 1 screw and release the bracket.
(2) Release the latches and take off the sensor.

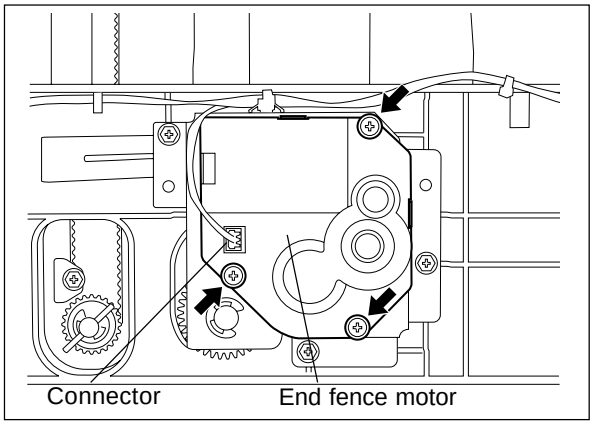


Note: Remember that the position where the end fence stop position sensor is installed depends on a paper size.



(G-8) End fence motor

(1) Disconnect 1 connector.
(2) Remove 3 screws, and take off the end fence motor.



10. PROCESS RELATED SECTION

10. 1. Construction
10. 2. Functions
10. 3. Charger Wire Cleaner Operational Circuit
10. 4. High-voltage Transformer Output Control Circuit
10. 4. 1. General description
10. 4. 2. Operation
10. 5. Surface Potential Sensor
10. 5. 1. General description
10. 5. 2. Construction
10. 5. 3. Control method
10. 6. Disassembly and Replacement

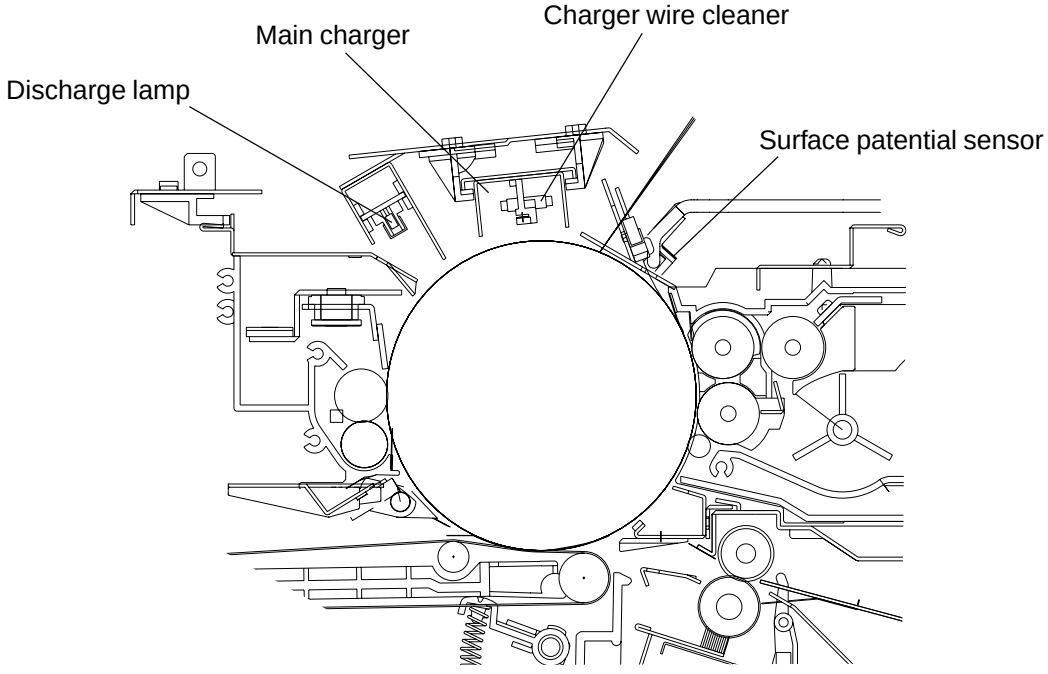
10. PROCESS RELATED SECTION

10. 1. Construction

This chapter describes the image formation process related units, parts and control circuit, etc. Mainly included in this chapter are the followings.

- Main charger
- Charger wire cleaner
- Discharge lamp
- Ozone filter
- High-voltage transformer
- Surface potential sensor
- Exhaust duct

The drum/cleaner unit, developer unit and transfer belt unit are described in other chapters.



[Sectional view]

10. 2. Functions

(1) Drum

The drum is a cylindrical aluminum base which is applied the organic photosensitive material (photoconductor) thinly on it. The photoconductor becomes insulative (low-electric resistance) at the dark places (out of the light) while it becomes conductive (high-electric resistance) under the light, so it is called a photoconductor.

(2) Main charger

The main charger is configured by stretching a charger wire between two insulation blocks provided at both ends of the U-shaped metal rod.

When a high voltage is applied to the charger wire, the air around the wire is ionized (electrostatically charged), and this ionized air is attracted onto the drum's surface. This phenomenon is referred to as the "corona discharge". In the dark, the surface of the drum is negatively (–) charged by the corona discharge of the main charger.

(3) Charger wire cleaner

The charger wire cleaner is for removing stain on the charger wire. It moves backward and forward to clean the charger wire after the power is turned ON and more than 2000 continuous copies have been made since the door switch was turned ON or the previous cleaning operation.

(4) Discharge lamp

Discharging is a process of reducing or eliminating the electrostatic charges on the drum.

The discharge lamp has two effects, a cleaning effect and pre-exposure effect. By the cleaning effect, it neutralizes and eliminates the residual charges on the drum surface by lowering the electrical resistance of the photosensitive surface by exposing it to the light, and by the pre-exposure effect, it keeps a fixed drum surface potential before the charging process.

(5) Ozone filter

The ozone filter decomposes ozone with its catalyst by absorbing the ozone, which has been generated through the corone discharge of the main charger, by the exhaust fan and letting it through the ozone filter.

(6) Surface potential sensor

The surface potential sensor detects the surface potential of the photoconductive drum and controls it to keep constant.

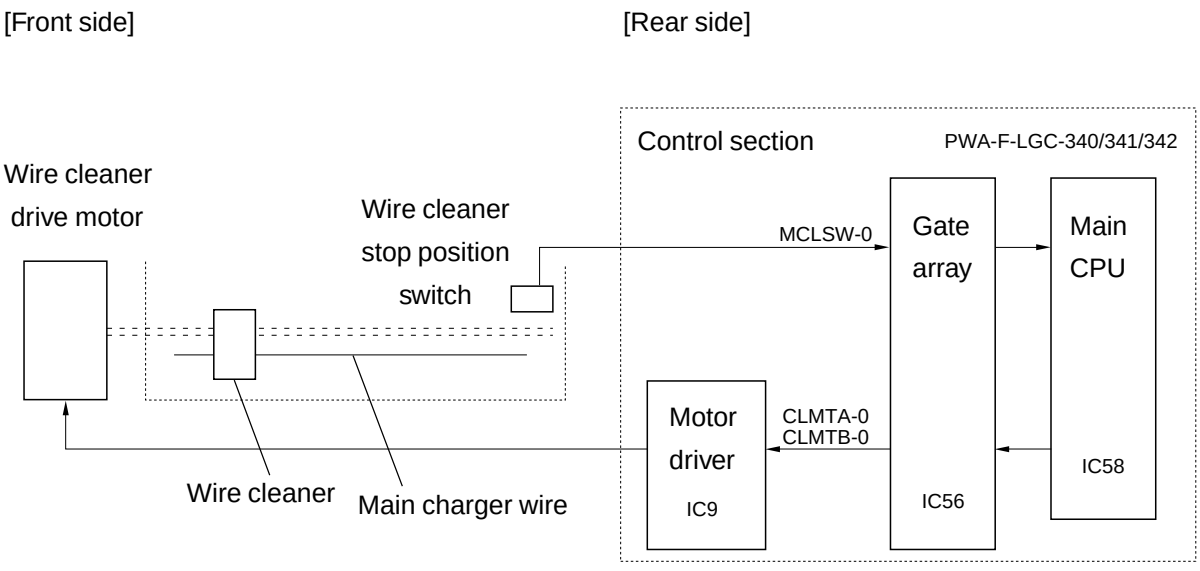
10. 3. Charger Wire Cleaner Operational Circuit

(1) Role of the charger wire cleaner circuit

This circuit is for cleaning the main charger wire. It reciprocates the wire cleaner regulary to avoid a poor charging and irregularities of the drum.

(2) Configuration of the chager wire cleaning circuit

- Wire cleaner drive motor : Driving of the wire cleaner
- Wire cleaner stop position switch : Detection of the wire cleaner reaching the limit (rear side)
- Control section : Controlling of the cleaner drive unit and cleaning of the wire



Drive unit control signal

	Signal		Status
	CLMTA-0	CLMTB-0	
Wire cleaner drive motor	"L" level	"L" level	OFF
	"H" level	"L" level	Reverse rotation (Home position → limit)
	"L" level	"H" level	Forward rotation (Limit → Home position)
	"H" level	"H" level	Brake

Stop position switch input signal

Signal	Status	
	"H" level	"L" level
MCLSW-0 (Stop position switch)	Not detected	Detected

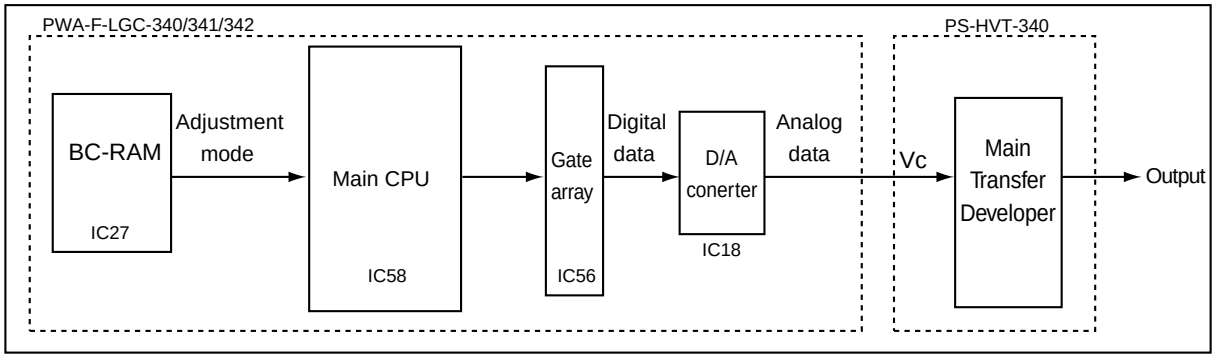
10. 4. High-voltage Transformer Output Control Circuit

10. 4. 1. General description

The high-voltage transformer output control circuit is a circuit that generates the output control voltage (Vc) for the main charger (Main), transfer belt power supply roller (Transfer), drum cleaning brush (Brush) and developer bias (Developer).

It changes the output current lineary by changing the Vc.

10. 4. 2. Operation



- Each adjustment value of the Main, Transfer and Developer in the BC-RAM is output to the main CPU.

↓

- The Vc data is output to the D/A converter from the main CPU.

↓

- The data is converted into the analog data at the D/A converter.

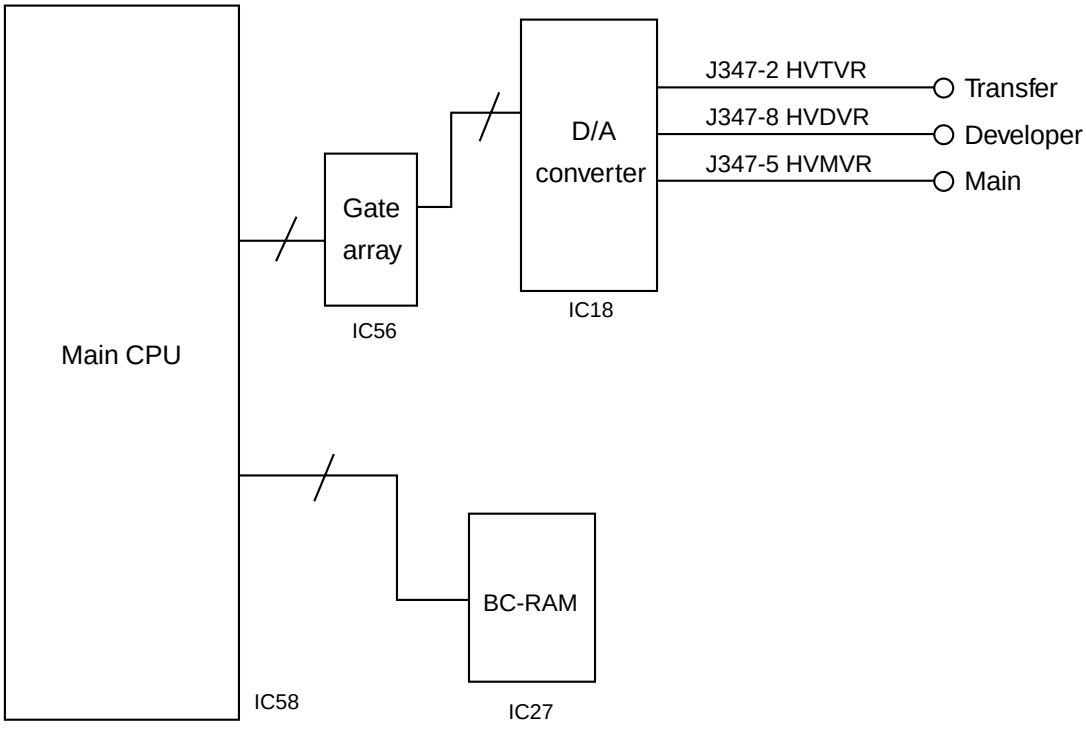
↓

- The Vc is output to the Main, Transfer, and Developer transformer.

↓

- The Main, Transfer, and Developer transformer generate an output current or voltage which is proportional to the Vc.

  * The adjustment of the Vc (changing of the adjusted data) is carried out at the adjustment mode.
  * The output value of the drum cleaning brush bias is fixed when the high-voltage transformer is delivered to the market.


Main CPU
IC58
Gate
array
IC56
D/A
converter
IC18
J347-2 HVTVR
J347-8 HVDVR
J347-5 HVMVR
Transfer
Developer
Main
BC-RAM
IC27

10. 5. Surface Potential Sensor

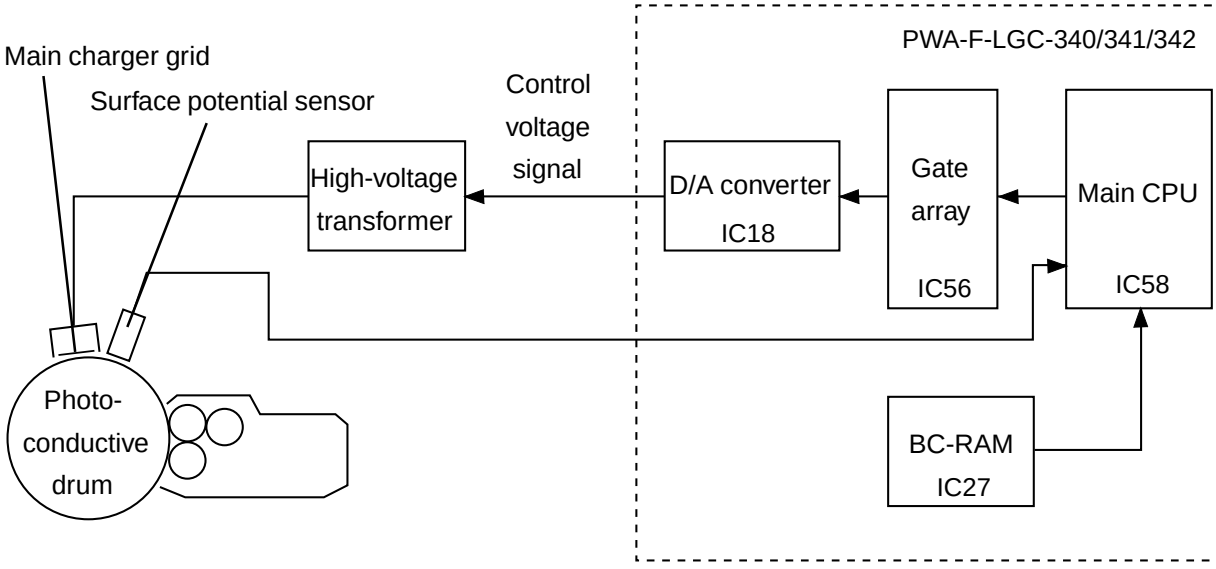
10. 5. 1. General description

The surface potential sensor detects the surface potential of the photoconductive drum and controls it to keep constant.

10. 5. 2. Construction

The surface potential is controlled by the following construction.

- Surface potential sensor : Detecting the surface potential of the photoconductive drum
- Control section : Controlling to keep the surface potential constant
- High-voltage transformer : Supplying voltage to the main charger grid



10. 5. 3. Control method

(1) Surface potential correction control

The adjusted output value of the main grid voltage in the BC-RAM is output to the main CPU.

→ Then control voltage data is output to the D/A converter from the main CPU through the gate array.

→ The data is converted into the analog data by the D/A converter and then amplified.

→ The control voltage of the main output is output to the high-voltage transformer.

→ The high-voltage transformer outputs the main grid voltage proportionate to the control voltage.

→ The surface potential sensor detects the potential on the photoconductive drum and gives it feedback to the main CPU.

→ The potential is compared to the control allowable level specified in the BC-RAM.

→ If the potential is out of the control allowable level, the main grid voltage to be changed is calculated from the difference between the targeted value and detection value.

→ The output value of the main grid voltage is changed.

(2) Conrol during warming-up

When the warming-up begins, the control is carried out following (1) at the previous page and the warming-up ends within the control allowable level.

(3) Control when finishing printing job

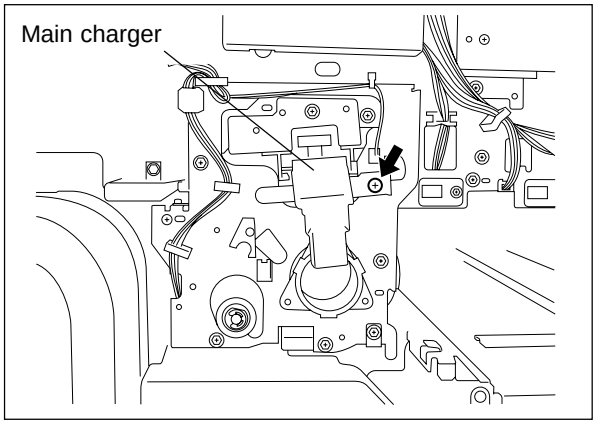
When the printing job has finished, the control is carried out following (1) at the previous page and the printing operation ends within the control allowable level.

10. 6. Disassembly and Replacement

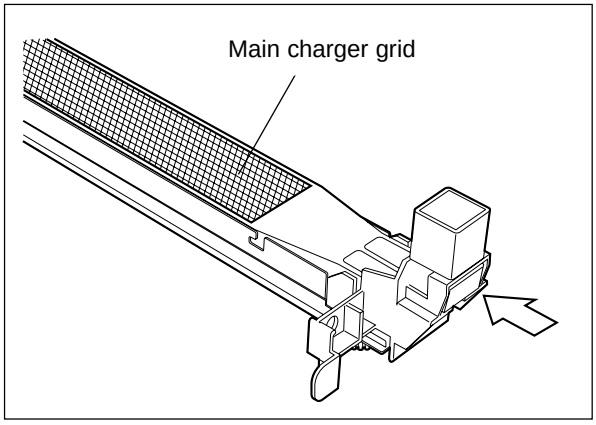
[A] Main charger

(1) Open the front cover and take off the front side right inner cover, toner cartridge drive unit and toner recycle unit. (► Chap.12.6)

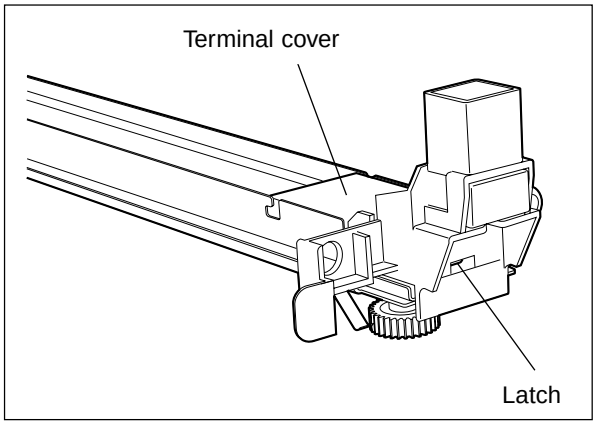
(2) Remove 1 screw and pull out the main charger.



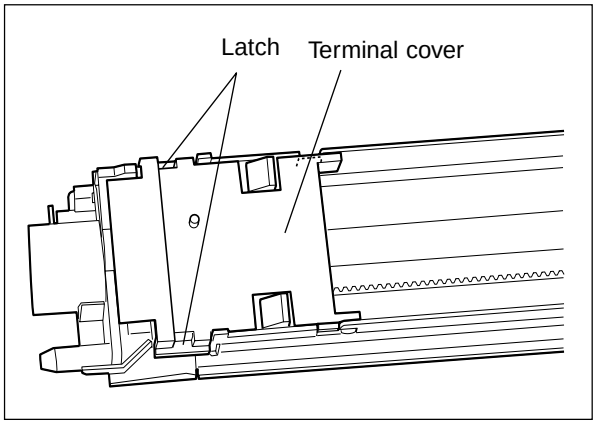
(3) Push the button to release the tension of the main charger grid and take off the grid.



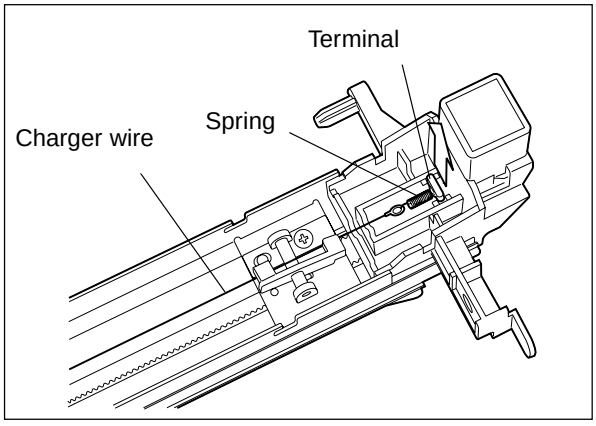
(4) Release 1 latch and take off the front side terminal cover.



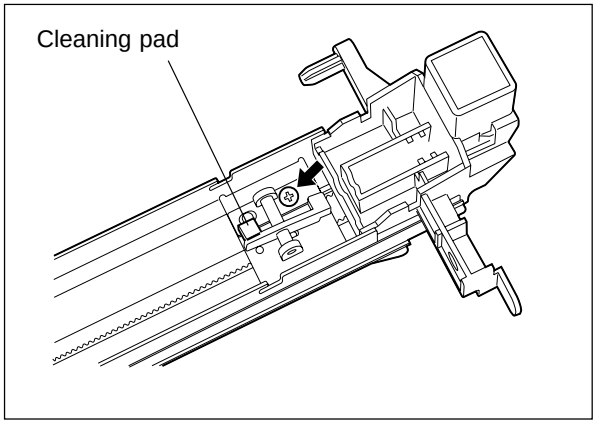
(5) Release 2 latches and take off the rear side terminal cover.



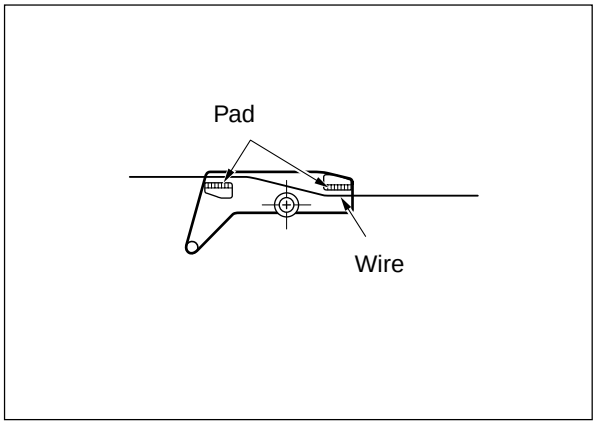
(6) Pull up the terminal, release the spring, unhook the rear side hook and take off the charger wire.



(7) Remove 1 screw and take off the cleaning pad.



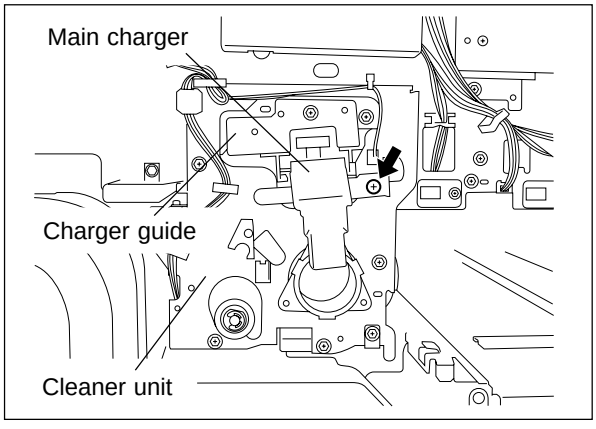
Note: When installing the cleaning pad, install it so that the charger wire go through the pad side.



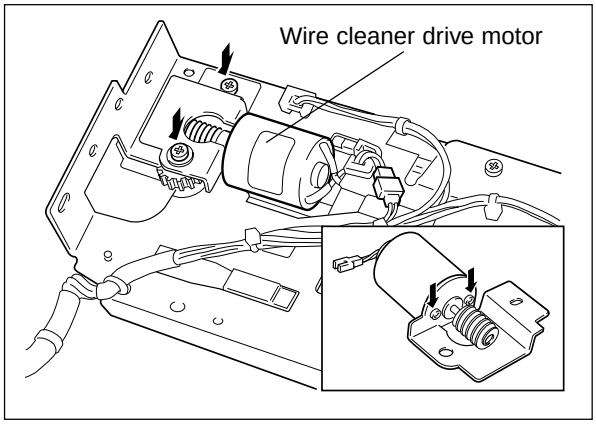
[B] Wire cleaner drive unit

(1) Remove the main charger and cleaner unit.

(2) Disconnect 1 connector, remove 1 screw and take off the charger guide.

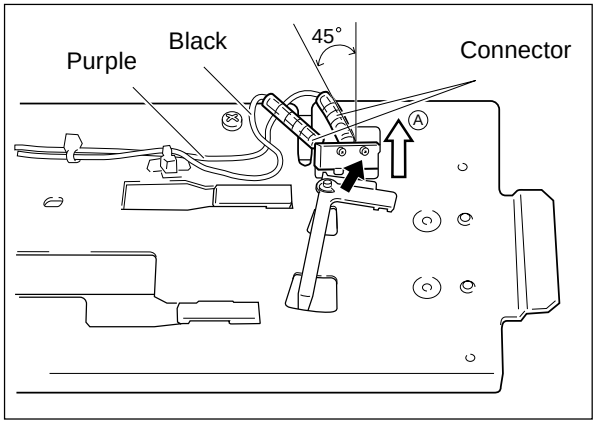


(3) Disconnect 1 connector, remove 2 screws and take off the wire cleaner drive motor with the bracket.
(4) Remove 2 screws and take off the motor.



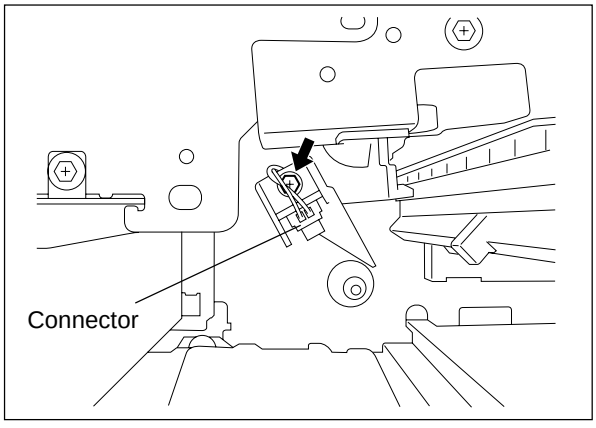
(5) Disconnect 2 connectors, remove 1 screw and take off the wire cleaner stop position switch.

Note: When installing the switch, fix it with pushing it toward the arrow Ⓐ. Also, pay attention to the color of the harness when connecting the connectors to the terminals, and then bend the terminals 45 degrees.



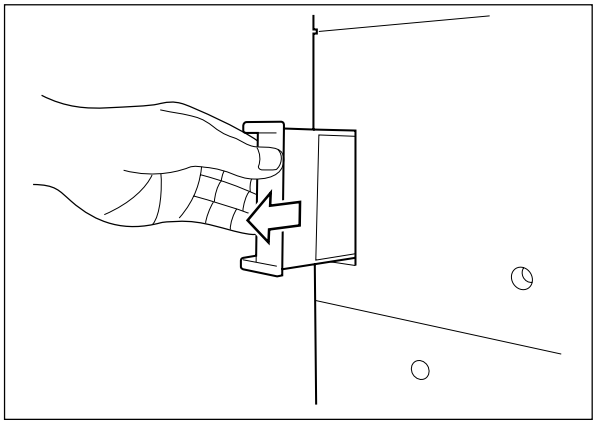
[C] Discharge lamp

(1) Remove the main charger and cleaner unit.
(2) Disconnect 1 connector, remove 1 screw and take off the discharge lamp.



[D] Ozone filter

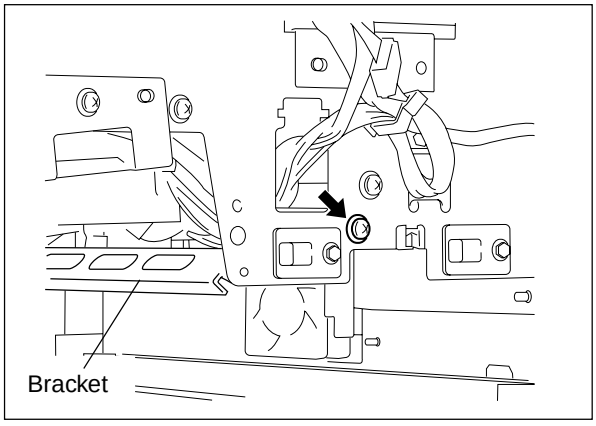
(1) Remove 1 screw and pull out the ozone filter at the exit side.



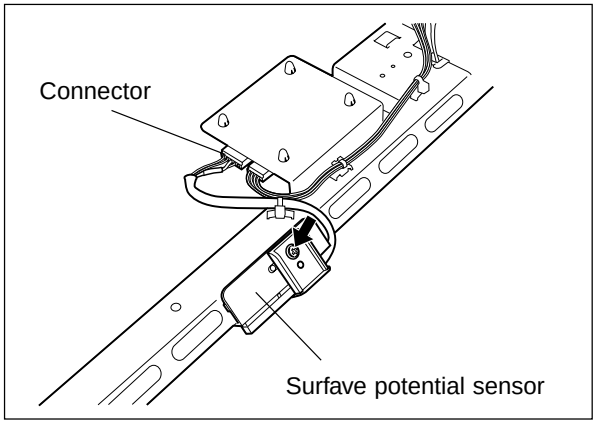
[E] Surface potential sensor

(1) Take off the developer unit, main charger, cleaner unit and control panel bottom cover.

(2) Disconnect 1 connector, remove 1 screw and take off the bracket.



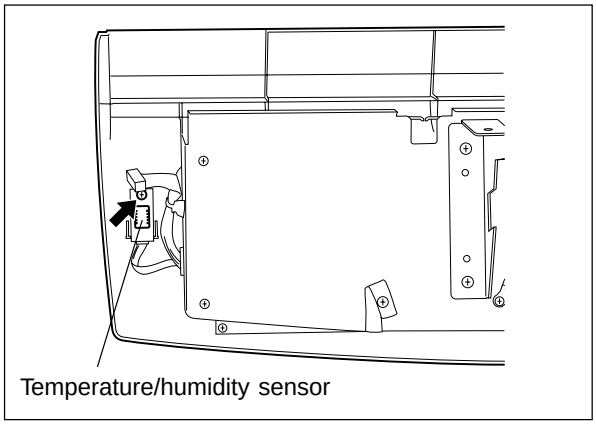
(3) Disconnect 1 connector, remove 1 screw and take off the surfave potential sensor.



[F] Temperature/humidity sensor

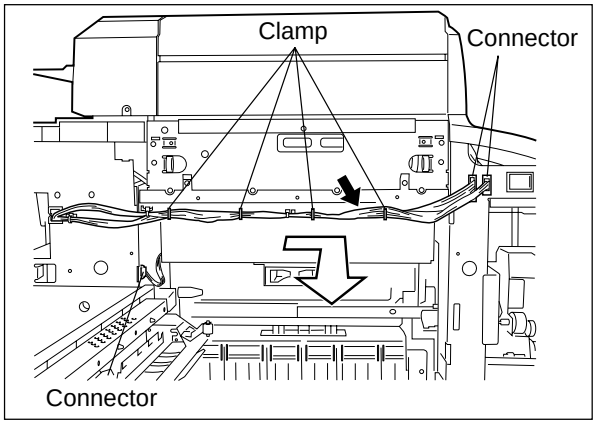
(1) Take off the control panel unit (► Chap.5.5).

(2) Disconnect 1 connector, remove 1 screw and take off the temperature humidity sensor.

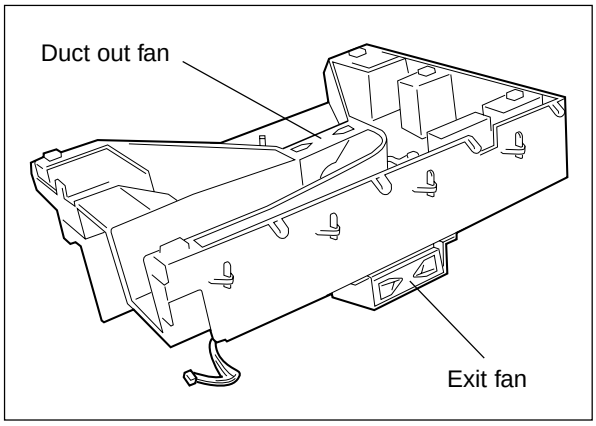


[G] Exhaust duct

(1) Take off the exit side upper cover and open the exit cover.
(2) Disconnect 3 connectors and release the harnesses from 4 clamps.
(3) Unhook the exhaust duct with sliding it toward the front side and pull it out.



(4) Disconnect 1 connector and pull out the duct out fan.
(5) Remove 2 screws and take off the exit fan with the bracket.
(6) Remove 2 screws and release the exit fan from the bracket.



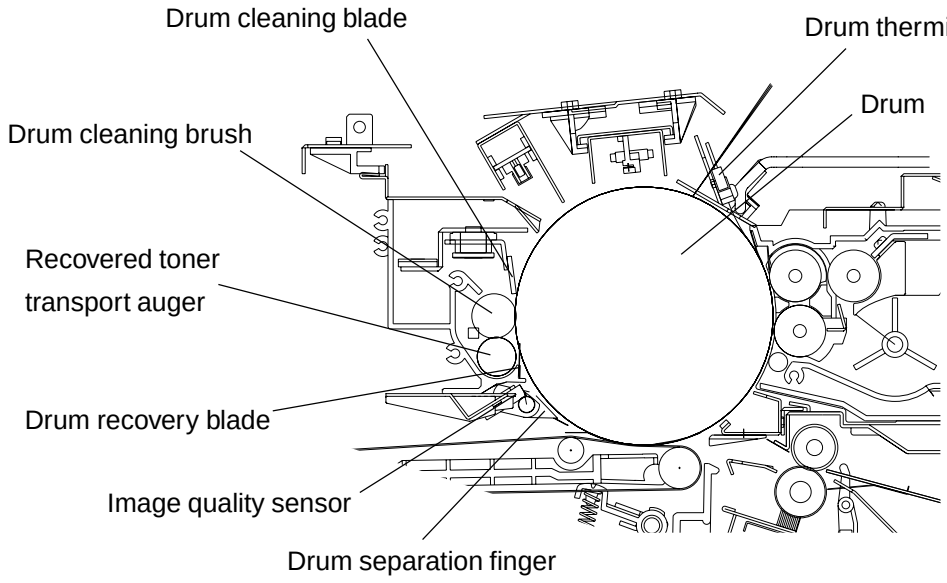
11. DRUM/CLEANER UNIT

11. 1. Construction
11. 2. Functions
11. 3. Drum Temperature Detection Circuit
11. 4. Image Quality Control
11. 4. 1. General description
11. 4. 2. Principle of sensor
11. 4. 3. Outline of control
11. 4. 4. Construction
11. 5. Disassembly and Replacement

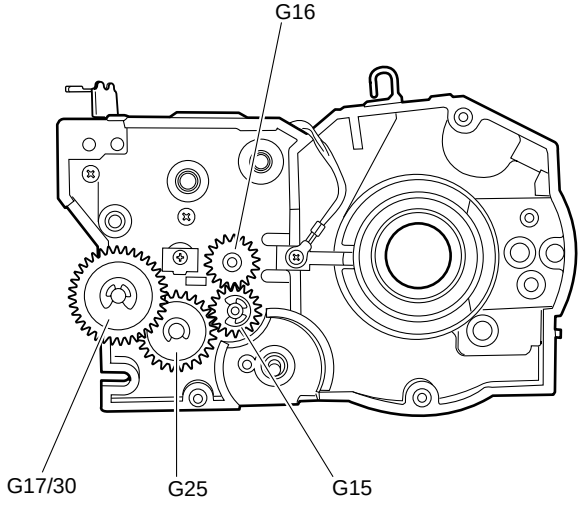
11. DRUM/CLEANER UNIT

11. 1. Construction

This chapter describes about the drum and cleaner unit related units, parts, control circuit, etc.
The cleaner unit consists of the drive section, cleaning section, recovered toner transport section, image quality sensor, drum separation finger, etc.



[Sectional view]



[Drive system]

11. 2. Functions

(1) Drum cleaning blade

It is pushed to the drum with a certain pressure by a weight and scrapes off the residual toner on the drum surface. The pressure is released and the blade is separated from the drum by turning the cam manually.

(2) Drum recovery blade

It catches the toner scraped by the drum cleaning blade.

(3) Recovered toner transport auger

It transports the scraped toner to the recycle unit.

(4) Drum separation finger

It is pushed to the drum by a solenoid only when the leading edge of the paper passes in order to separate the paper which has not been separated by the transfer belt.

(5) Image quality sensor

It assesses the relative reflective rate for the test pattern (toner image) formed on the drum in order to keep the image density and line width properly.

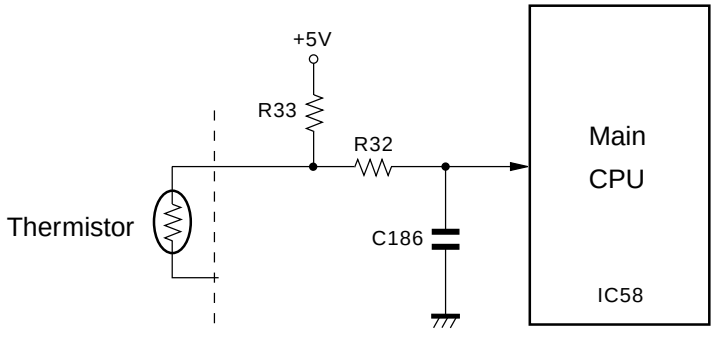
(6) Drum thermistor

Since the charging amount changes depending on the temperature of the drum surface, the drum thermistor detects the temperature of the drum surface and controls to unify the charging amount.

(7) Drum cleaning brush

It eliminates the paper dusts and extraneous substance adhered to the drum surface after separating the paper and also decrease the friction of the drum cleaning blade to lengthen its life span, which improves the image reliability.

11. 3. Drum Temperature Detection Circuit



Drum temperature detection circuit

At this detection circuit, the voltage gained by the R33 and thermistor is input into the A/D converter of IC 58 to detect the drum surface temperature.

11. 4. Image Quality Control

11. 4. 1. General description

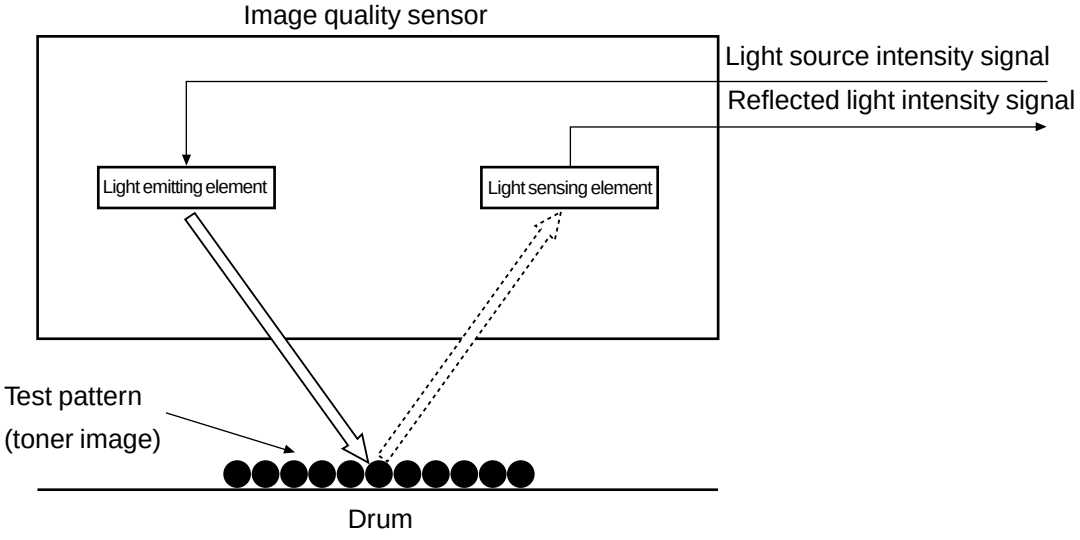
This copier carries out the image quality control with the image quality sensor. The image quality control is for changing the image formation condition to minimize the changing of the image density and line width caused by the environment and life.

The image quality sensor detects the density of the test pattern developed on the drum, and the image formation condition is changed depending on the result.

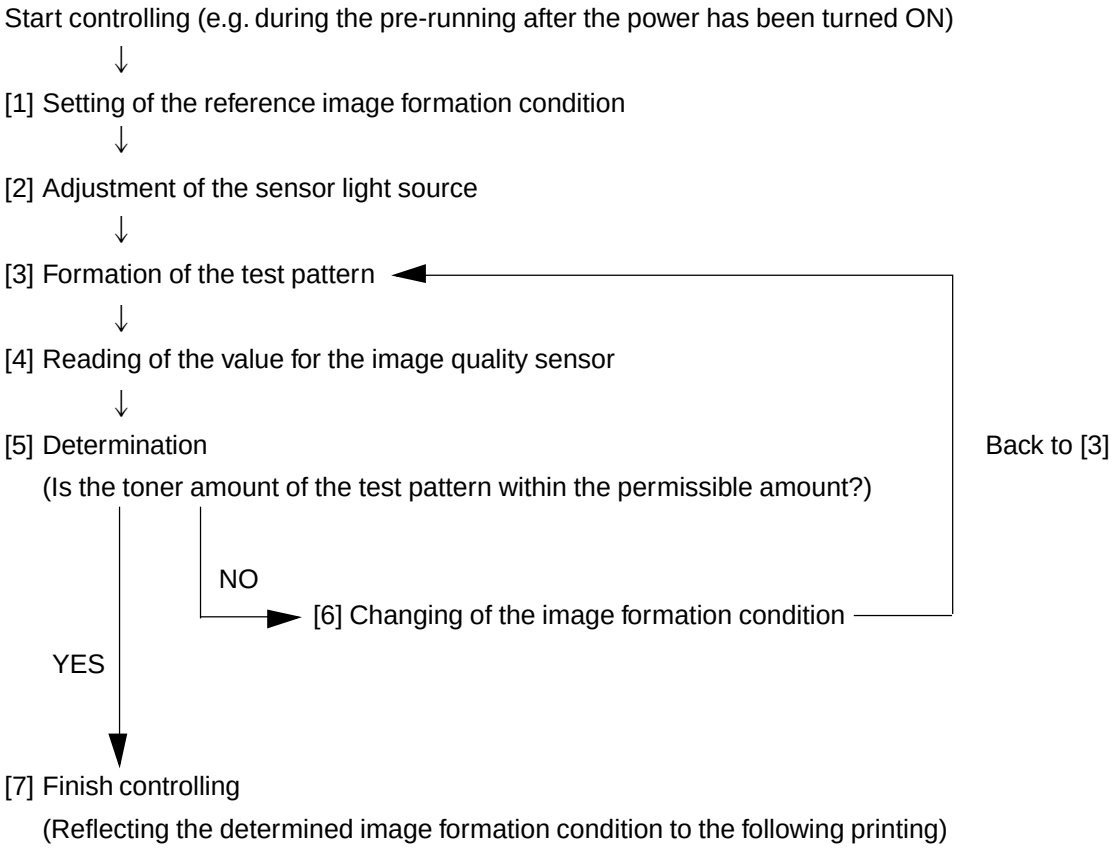
11. 4. 2. Principle of sensor

The image quality sensor applies the light to the drum and toner image (test pattern) developed on the drum and outputs the voltage corresponding to its reflected light amount.

A relative reflectivity is assessed by the reflected light amount obtained by the image quality sensor.

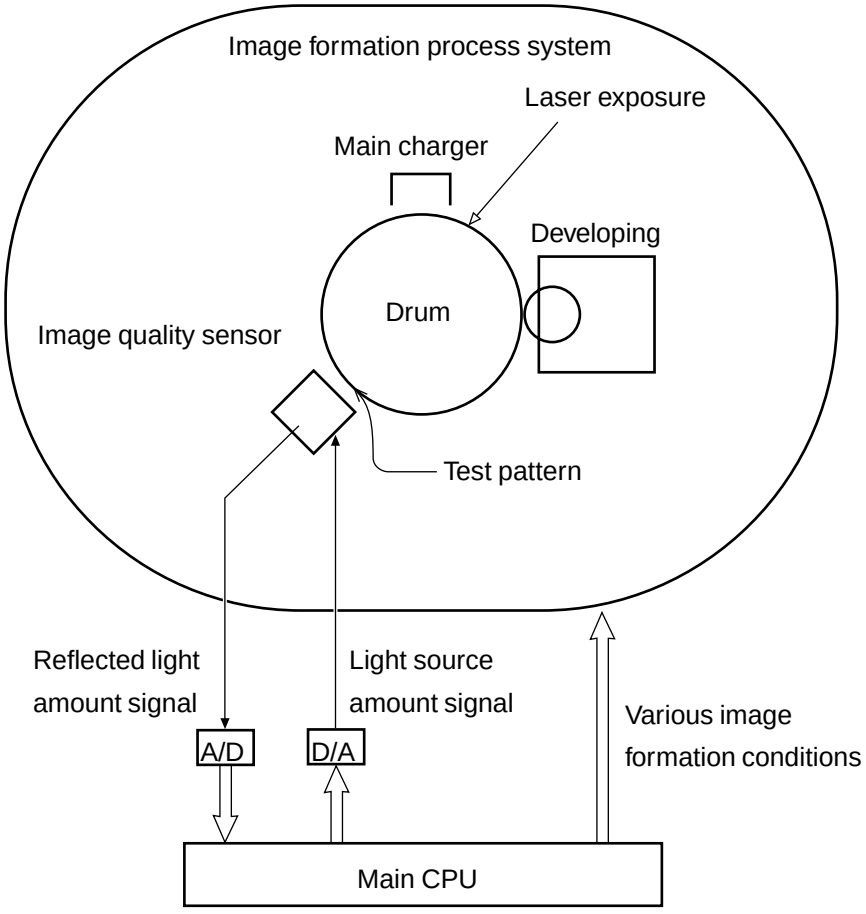


11. 4. 3. Outline of control


Start controlling (e.g. during the pre-running after the power has been turned ON)
[1] Setting of the reference image formation condition
[2] Adjustment of the sensor light source
[3] Formation of the test pattern
[4] Reading of the value for the image quality sensor
[5] Determination
(Is the toner amount of the test pattern within the permissible amount?)
Back to [3]
NO
[6] Changing of the image formation condition
YES
[7] Finish controlling
(Reflecting the determined image formation condition to the following printing)

11. 4. 4. Construction

- Image quality sensor : Emitting of the light which corresponds to the light control voltage to output the voltage which corresponds to the reflective light amount for the toner image on the drum
- D/A converter : Outputting of the light source light control voltage
- Laser optical unit : Carrying out the test pattern exposere to form the toner image
- A/D converter : Converting of the sensor output voltage into the digital value
- Image formation process system : Charging/Laser exposuring/Developing
- CPU : Carrying out of the procedure [1]~[7] described in the previous page

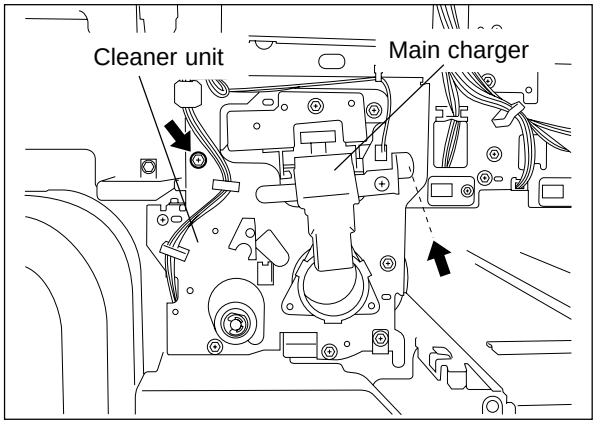


11. 5. Disassembly and Replacement

[A] Cleaner unit

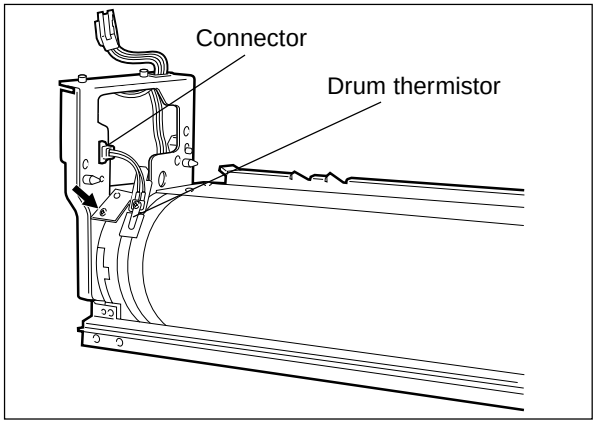
(1) Open the front cover and take off the front side right inner cover, toner cartridge drive unit, toner recycle unit, developer unit and main charger.

(2) Remove 2 screws and pull out the cleaner unit.



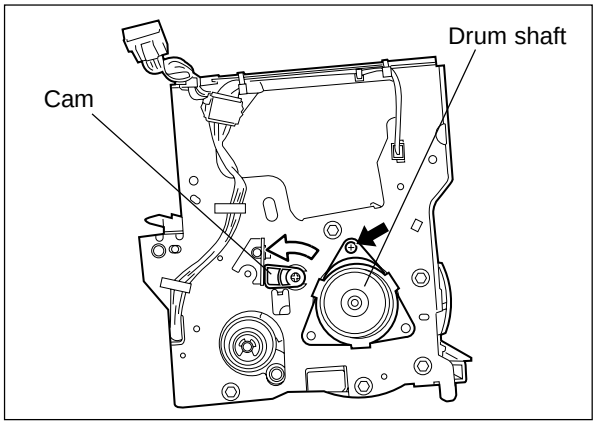
[B] Drum thermistor/Drum

(1) Disconnect 1 connector and remove 1 screw. Then take off the drum thermistor with the bracket.

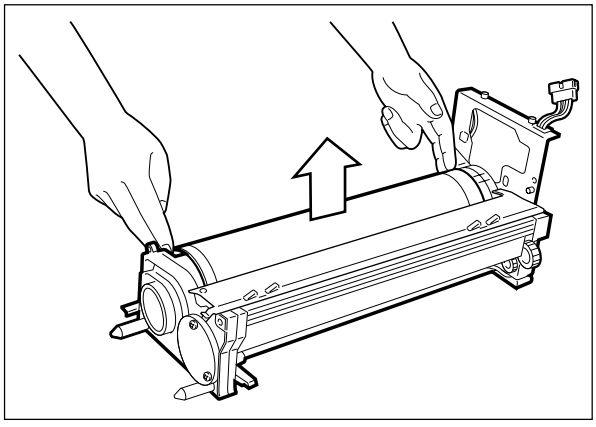


(2) Turn the cam to release the pressure of the cleaning blade.

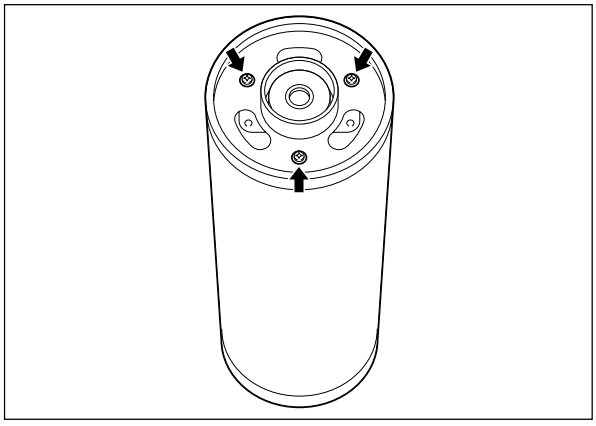
(3) Remove 1 screw and take off the drum shaft.



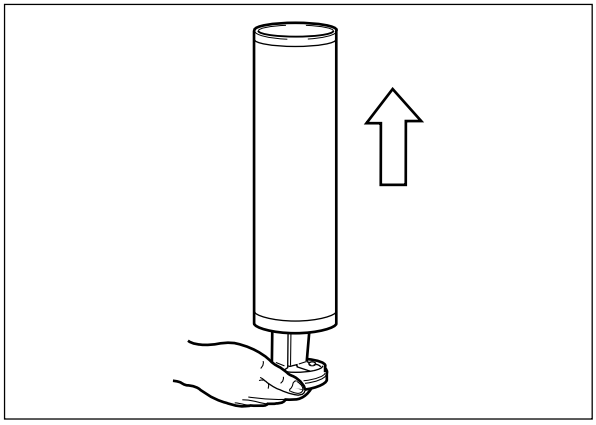
(4) Pull out the drum upward.



(5) Remove 3 screws and take off the front side flange.

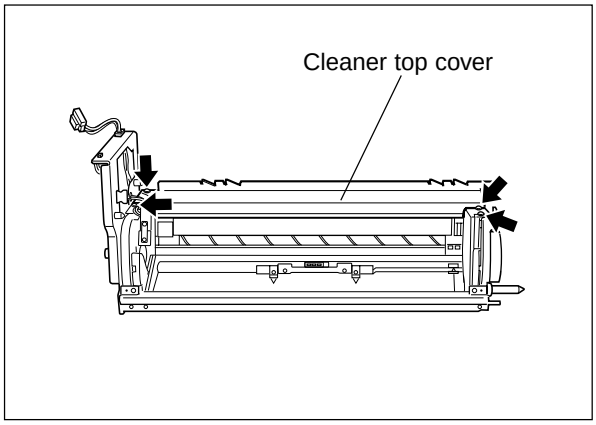


(6) Pull out the drum upward.

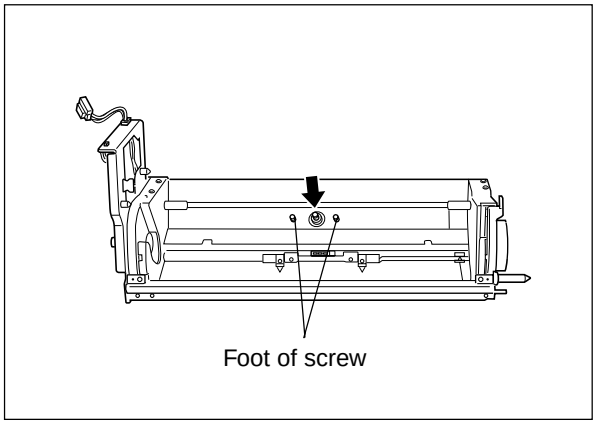


[C] Cleaning blade

(1) Pull out the drum.
(2) Remove 4 screws and take off the cleaner top cover.

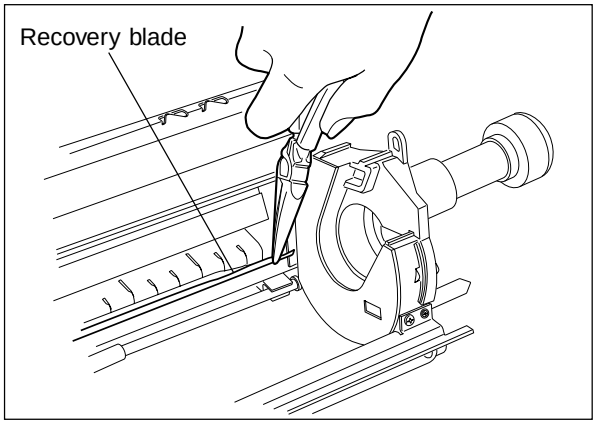


(3) Turn over the cleaning blade with holding the bracket.
(4) Remove 1 screw.
(5) Pull out the cleaning blade with holding each foot of 2 screws.



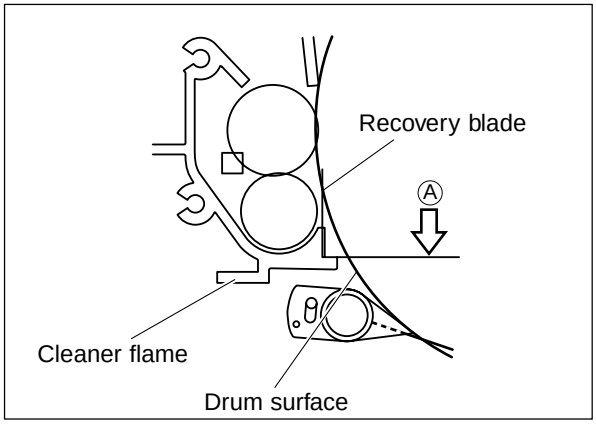
[D] Recovery blade

(1) Remove the recovery blade.



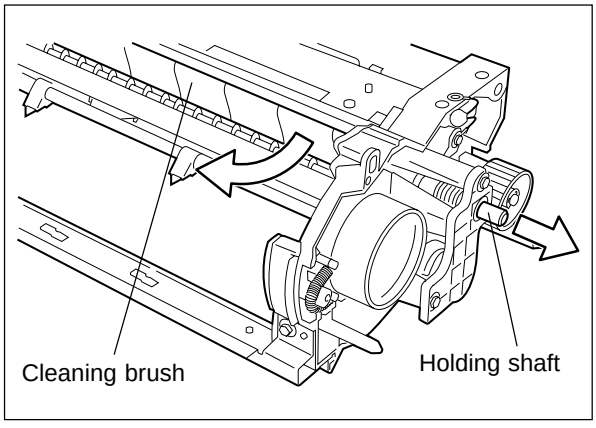
Notes: 1. The recovery blade is attached with a double-faced tape, so remove the tape compeletely before attaching a new blade.

2. Attach the recovery blade fitting its bottom edge into the notch of the cleaner frame.



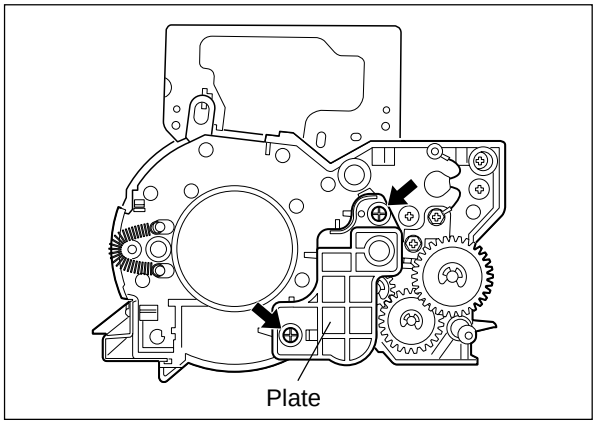
[E] Cleaning brush

(1) Pull out the rear side holding shaft and take off the cleaning brush.

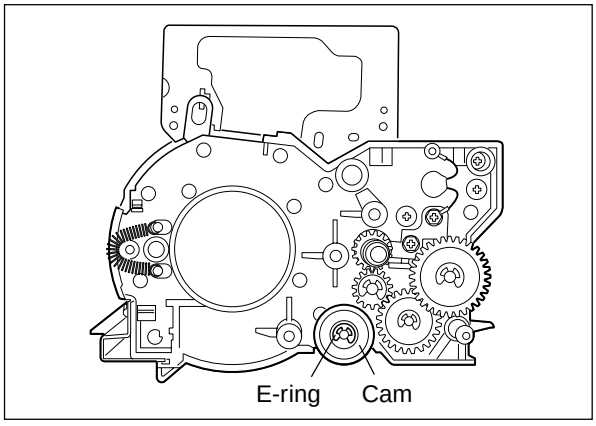


[F] Drum separation finger

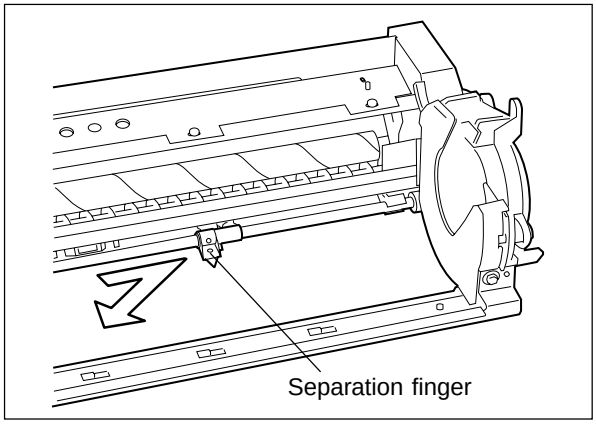
(1) Remove 2 screws and take off the plate at the rear side.



(2) Remove 1 E-ring and take off the cam.

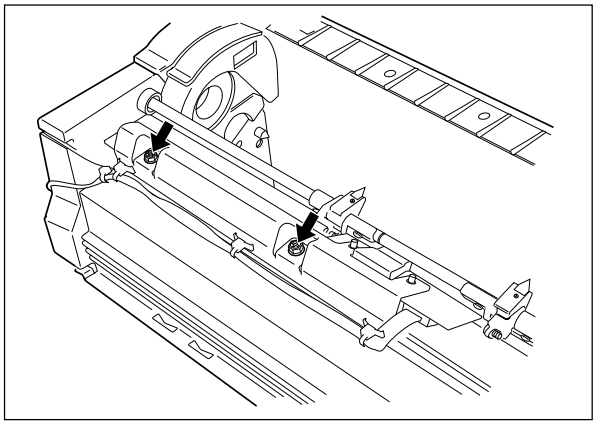


(3) Move the shaft of the separation finger toward the rear side and pull it out.
(4) Remove the screws and pull out the separation fingers from the shaft.

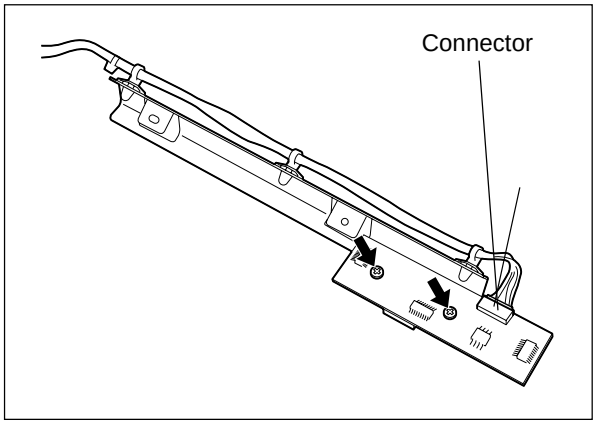


[G] Image quality sensor

(1) Remove 2 screws and take off the sensor with the bracket.

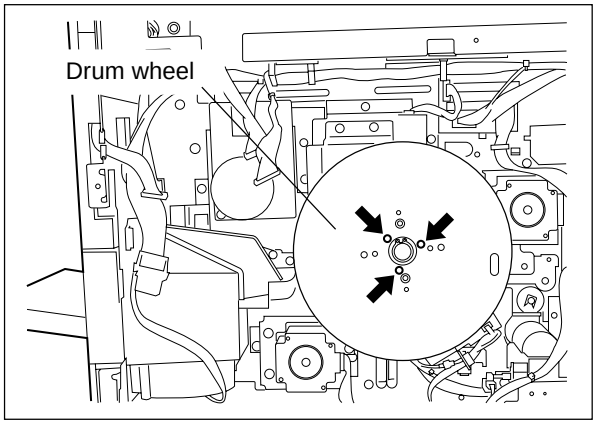


(2) Remove 2 screws and take off the image quality sensor.



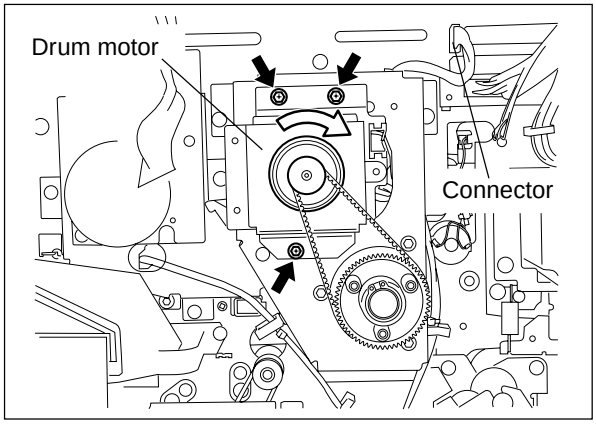
[H] Drum motor

(1) Remove the rear cover and take off the SYS board and hard disk with the bracket.
(2) Remove 3 screws and take off the drum wheel.



(3) Disconnect 1 connector and remove 3 screws to take off the drum motor with the bracket.
(4) Remove 3 screws and take off the motor.

Note: When installing the drum motor, fix it keeping the bracket in the direction of the white arrow.



12. DEVELOPER UNIT

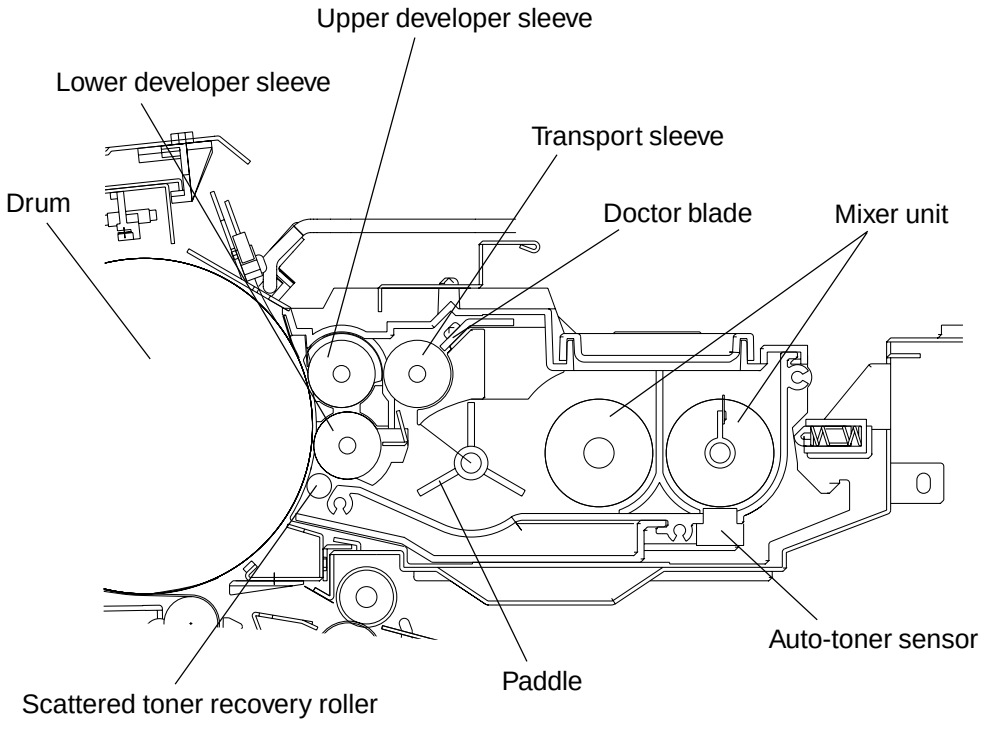
12. 1. Construction
12. 2. Functions
12. 3. Developer Unit Drive
12. 4. Motor Drive Circuit
12. 4. 1. Toner motor
12. 4. 2. Developer motor
12. 5. Auto-toner Sensor Circuit
12. 5. 1. General description
12. 5. 2. Operation of auto-toner sensor
12. 6. Disassembly and Replacement

12. DEVELOPER UNIT

12. 1. Construction

This chapter describes about the following units related to the development process, parts, control circuit, etc.

- Toner cartridge drive unit
- Toner recycle unit
- Developer unit
  - Developer material
  - Mixer unit
  - Paddle
  - Transport sleeve (magnetic roller)
  - Upper/Lower developer sleeve
  - Doctor blade
  - Auto-toner sensor
  - Scattered toner recovery roller
- Developer unit drive section



[Developer unit sectional view]

12. 2. Functions

(1) Toner cartridge drive unit

The toner cartridge is filled with toner and supplies it to the developer unit with the driving of the new toner supply motor.

(2) Toner recycle unit

This copier takes a toner recycle method. The toner recovered from the drum surface with the cleaner is transported to the developer unit by the toner recycle unit and then reused.

(3) Developer unit

a. Developer material

The developer material consists of the carrier and toner. The carrier is made up with the electrically conductive ferrites which size is as big as 30~100µm and the toner is made up with the resin particles which size is as big as 5~20µm. Since the developer material gets deteriorated after a long time of use, regular replacements are needed.

b. Mixer unit

When stirring the developer material, the carrier and toner are frictionized each other, causing the carrier to have a positive (+) charge and the toner to have a minus (–) charge. The toner adheres to the drum surface as a result of the electrostatic force.

c. Paddle

The paddle supplies the developer material stirred with the mixer unit to the transport sleeve and gets the material separated from the lower developer sleeve back to the mixer.

d. Transport sleeve/Developer sleeve (magnetic roller)

These rollers are made of aluminum each having a magnet inside. With this magnet, the developer material is absorbed to form the magnetic brush. The magnet is fixed, so only its ambient sleeve rotates. By this rotation, the developer material is transported to the developer sleeve from the transport sleeve. Then the magnetic brush formed at the developer sleeve moves on the drum surface like a sweeping broom and the development is carried out.

e. Doctor blade

This is for controlling the amount of the developer material which is to be transported from the transport sleeve so that the magnetic brush can get in touch with the drum surface properly.

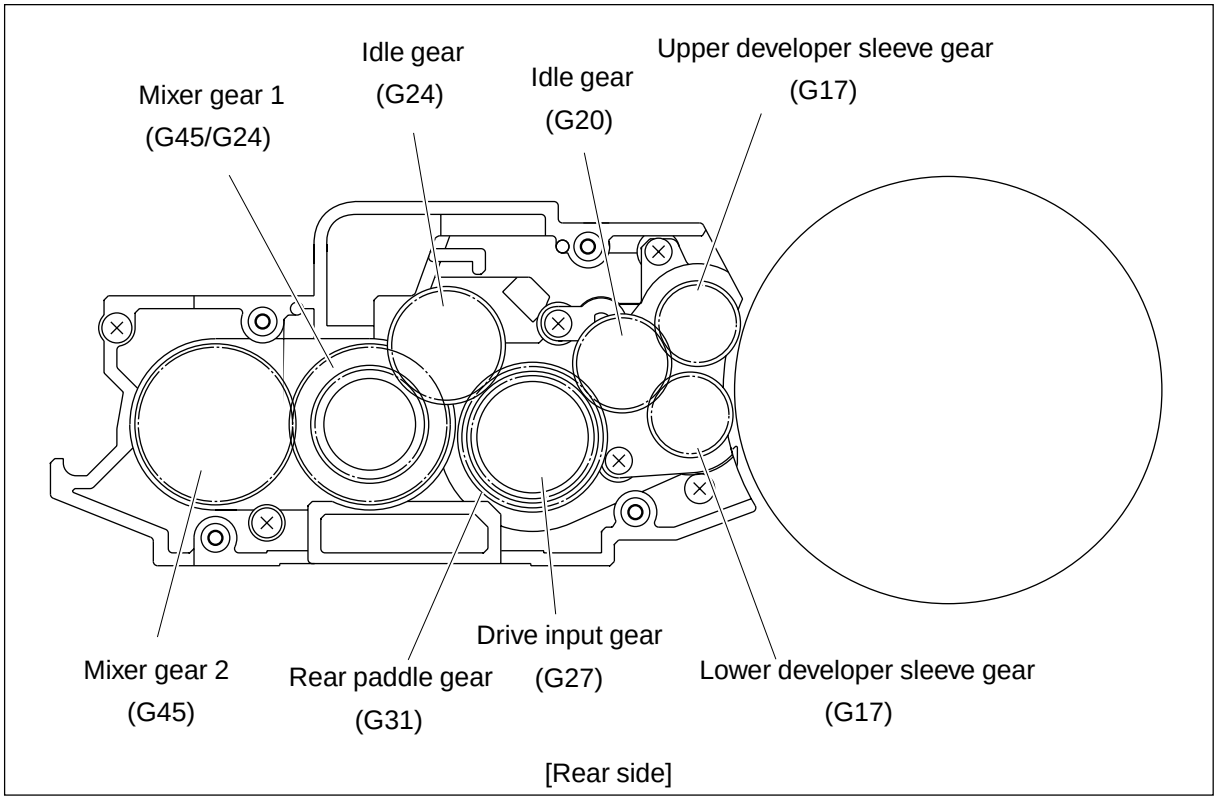
f. Auto-toner sensor

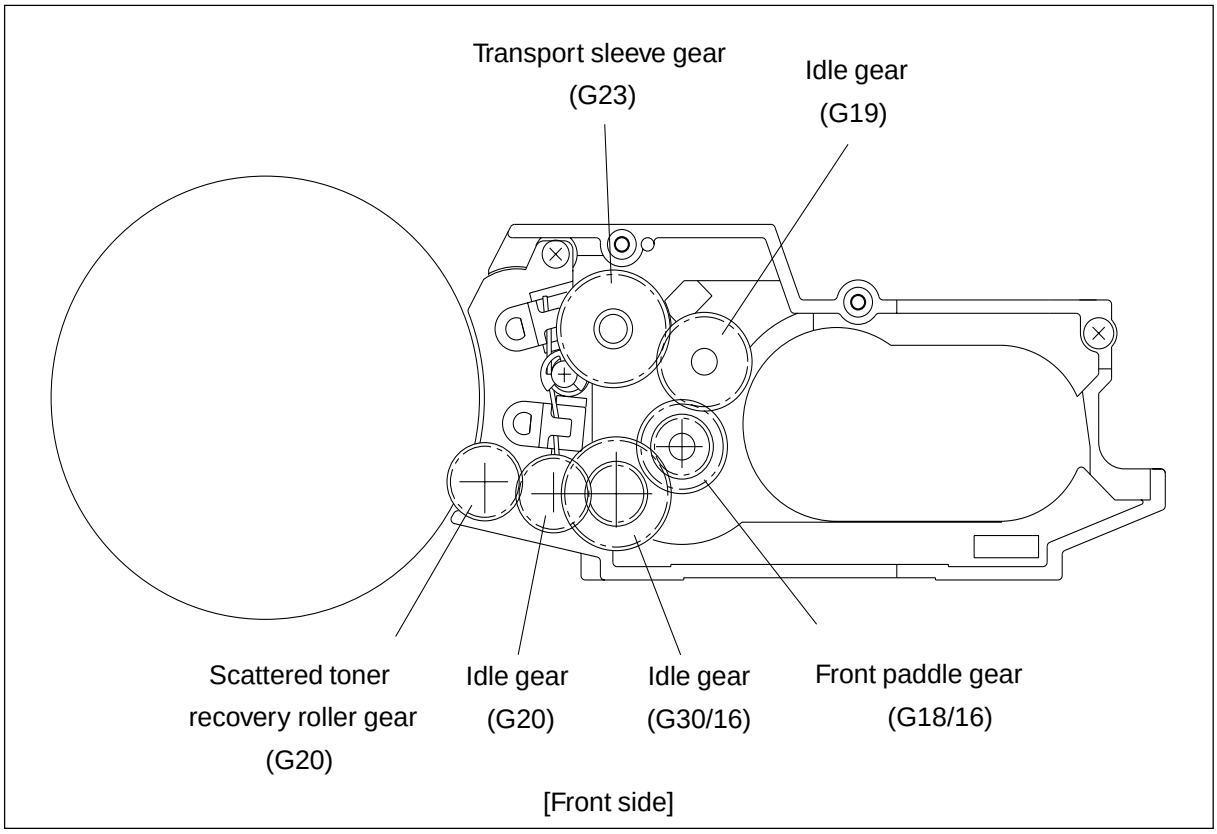
To output a normal image, the proportion (toner density ratio) of the carrier and toner in the developer material needs to be always constant. The auto-toner sensor detects the toner ratio in the developer material with applying the magnetic bridge circuit and suppies the toner from the toner cartridge and recycle toner hopper by driving the new toner supply motor and recycle toner hopper motor when the toner becomes to be run short.

g. Scattered toner recovery roller

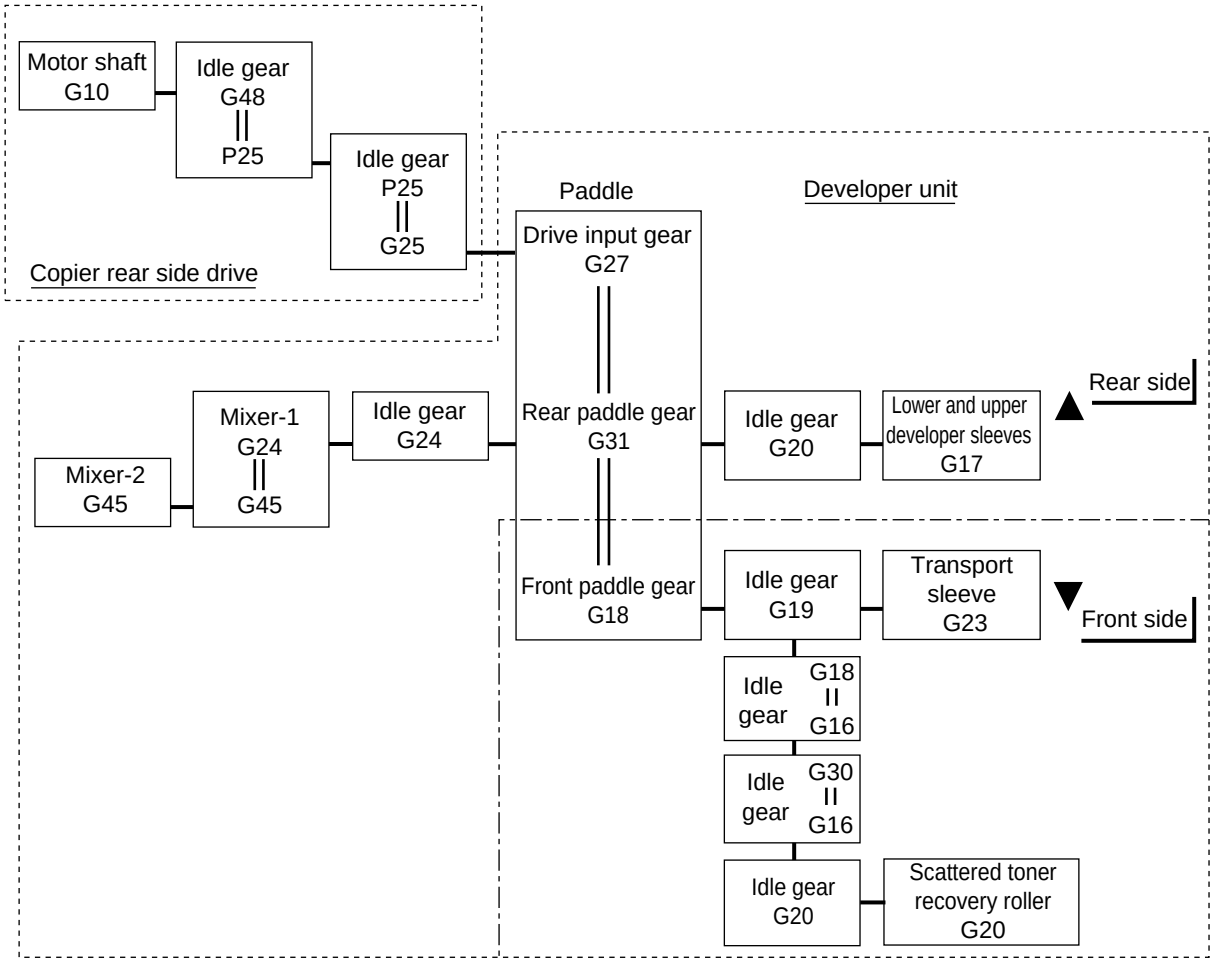
This is a roller for trapping and recovering the toner scattered from the developer sleeve not to get outside of the developer unit.

12. 3. Developer Unit Drive





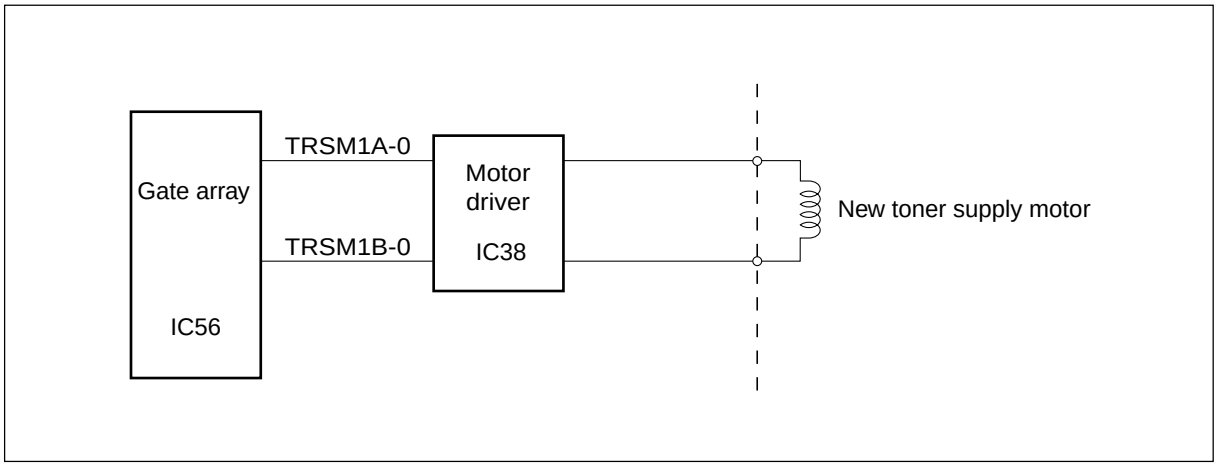
Developer unit drive



12. 4. Motor Drive Circuit

12. 4. 1. New toner supply motor

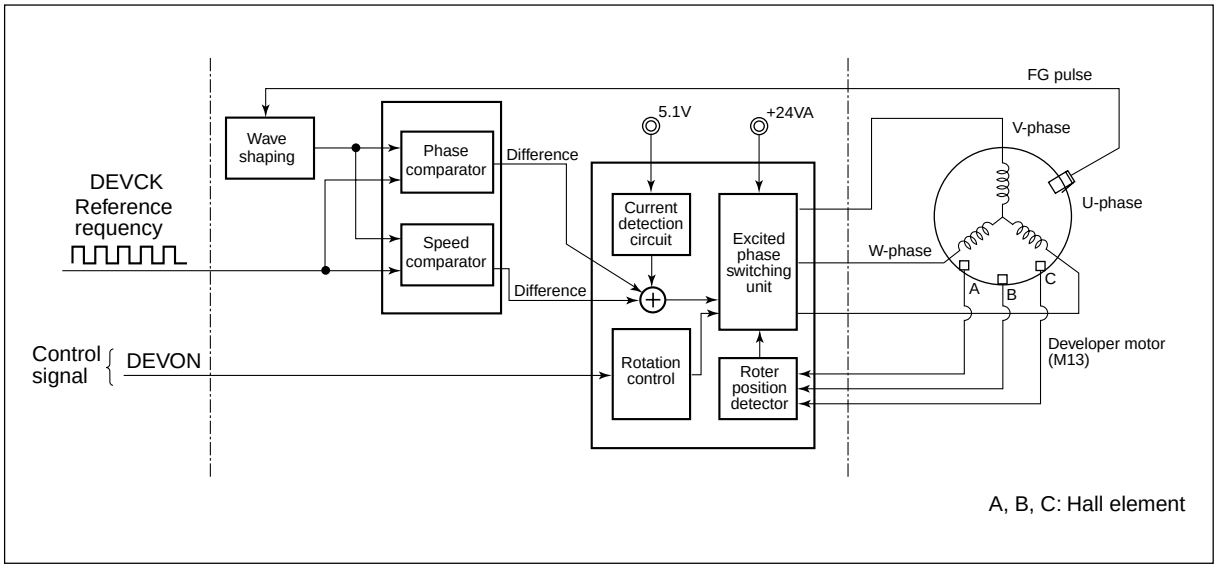
The new toner supply motor (brush motor) is a motor for supplying toner to the developer unit from the toner cartridge. It is driven by the motor driver IC38, and its circuit configuration is shown in the following.



Signal level for motor circuit

	Signal		State
	TRSM1A-0	TRSM1B-0	
Level	L	L	OFF
	H	L	CW (when supplying toner)
	L	H	CCW (detecting cartridge installation)
	H	H	Brake

12. 4. 2. Developer motor



(1) The LGC transmits control signals for the developer motor rotation (DEVON: motor rotation command).

(2) The excitation phase switching unit excites each phase on the developer motor. Developer motor rotates.

(3) Hall elements A to C are used to detect the rotational position of the motor (rotor).

(4) The excitation phase switching unit switches the excitation for each phase. (By repeating steps (2) through (4) above, the motor keeps rotating.)

(5) The FG pulse is generated by the rotation of the developer motor.

(6) The phases and velocities of the FG pulse and the reference frequency from the LGC are compared, and the differences are added. Further to this are added the fluctuations in the power supply voltage (signal generation).

(7) Changes the switching timing for the excitation phase switching unit to match the signal amount obtained in step (6).
That is, the FG pulse and reference frequency are controlled to be equal. The developer motor rotates at a constant speed (locked range state).

(8) When the DEVON signal changes to “H” level, the developer motor stops.

<Control signals>

(1) DEVCK signal (LGC DEV-MOT: input)

This signal is a reference clock signal for the developer motor to rotate at a fixed speed. The frequency of the reference clock is 821.2Hz.

When the cycle of the FG pulse deviation from the reference frequency is within ±6.25%, this state is specified as lock range (normal rotation). Also, at this time, the LED "D4" light comes ON.

(2) DEVON signal (LGC DEV-MOT: input)

This signal is the motor ON/OFF control signal. When it becomes "L" level, the motor rotates.

Signal level for motor circuit

Signal	"H" level	"L" level
DEVCK	Reference clock (821.2Hz)	
DEVON	Motor OFF	Motor ON

12. 5. Auto-toner Sensor Circuit

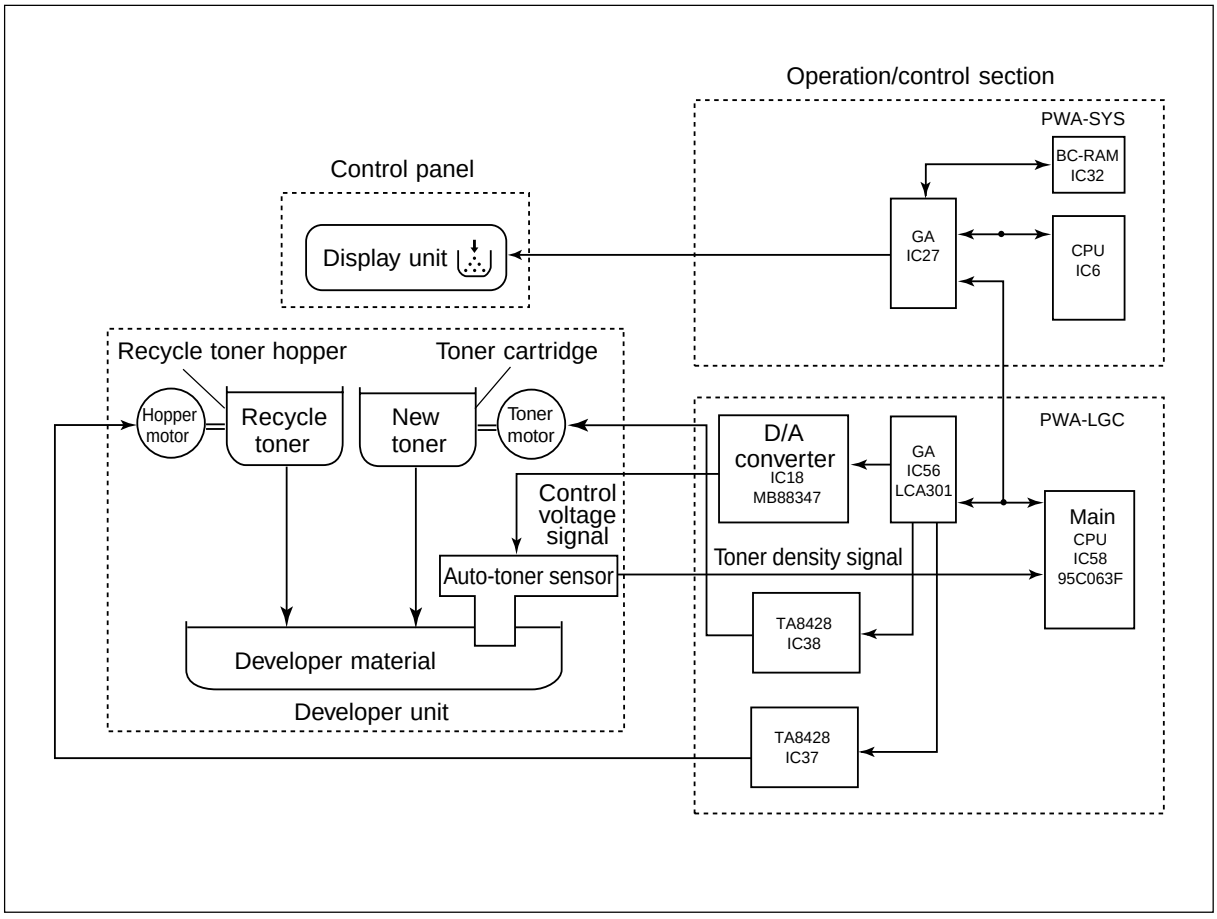
12. 5. 1. General description

(1) Functions of auto-toner circuit

- Detection of the toner density in the developer material
  ~ density lowered →toner supplied
- Detection of the toner being empty in the toner cartridge

(2) Configuration of auto-toner circuit

- Auto-toner sensor : Detecting the toner density
- Control section : Controlling to keep the developer material toner density constant
- New toner supply motor : Supplying new toner to the developer material
- Display unit : Displaying the toner empty status
- Recycle toner hopper motor : Supplying the recycle toner to the developer material



12. 5. 2. Operation of auto-toner sensor

(1) Functions of the auto-toner sensor

a. Initializing function: When the copier is set up or when the developer material is replaced

The automatic adjustment is made so that the output of the auto-toner sensor (input value of the main CPU) will be 2.45 to 2.55V for the toner density of new developer material.

b. Toner density stabilizing function: During the printing operation

Through the following phases, the toner density is kept constant.

Toner consumed
→ Toner density decreased
→ Output change of the auto-toner sensor depending on the humidity detected
→ Recycle toner hopper and new toner supply motor driven
→ Toner supplied to the developer unit from the recycle toner hopper and toner cartridge

c. Toner-empty detection, release function

Toner-empty detection in the toner cartridge.

New toner supply motor driven
→ Output of the auto-toner sensor not changed
→ Toner density not changed
→ Toner-empty detected

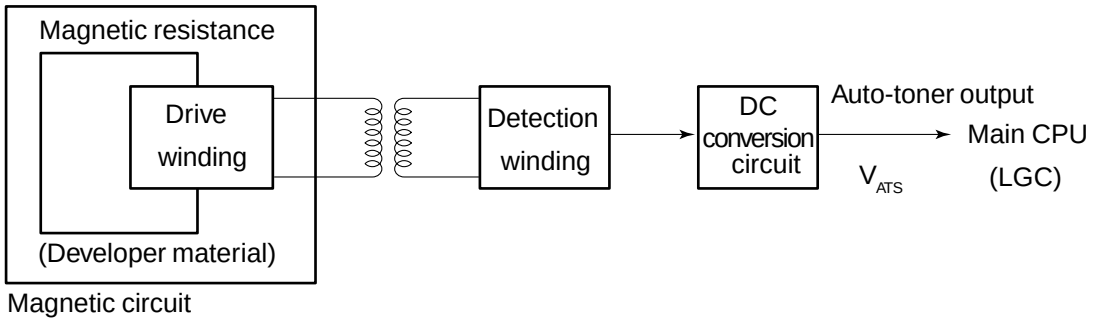
Toner-empty release

New toner supply motor driven
→ Toner supplied from the toner cartridge
→ Output of the auto-toner sensor changed
→ Toner density recovering to its normal value
→ Toner-empty released

(2) Operation of the auto-toner sensor

The auto-toner sensor is composed of the following circuits.

Drive winding	: Magnetic head (primary side) with a high-frequency magnetic field, which forms a magnetic circuit in the developer material
Detection winding	: Receiving the changes in the magnetic resistance of the developer material via a magnetic circuit (secondary side)
DC conversion circuit	: Converting the figh-frequency output from the detection winding to a DC signal



When the toner density is low:

Toner ratio to the carrier in the developer material decreased
→ Magnetic resistance decreased
→ Detection output increased
→ Auto-toner output V_{ATS} increased

When the toner density is high:

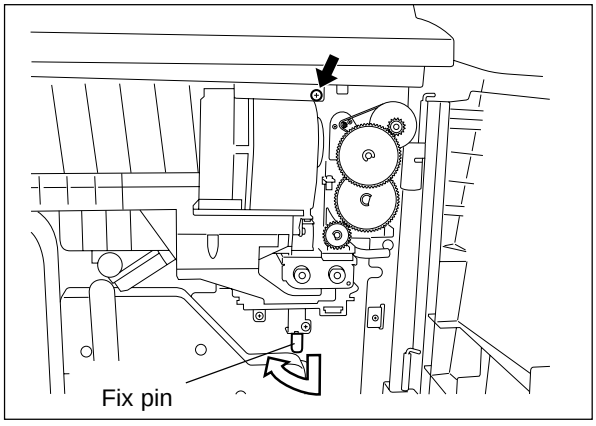
Toner ratio to the carrier in the developer material increased
→ Magnetic resistance increased
→ Detection output decreased
→ Auto-toner output V_{ATS} decreased

12. 6. Disassembly and Replacement

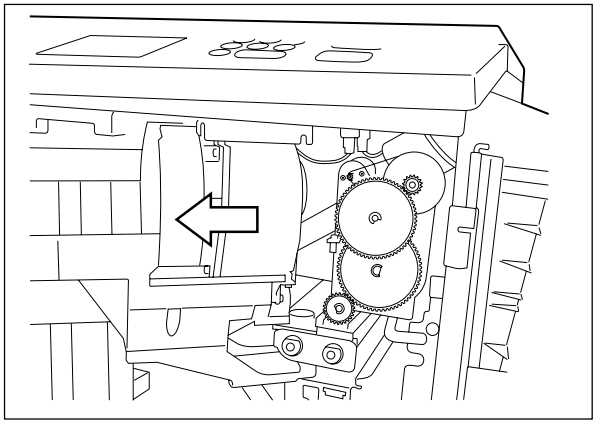
[A] Toner cartridge drive unit

(A-1) Toner cartridge drive unit

(1) Open the front cover and take off the toner cartridge and front side inner cover.
(2) Loosen 1 screw and take off the bracket.
(3) Disconnect 1 connector.
(4) Pull down the fixing pin and turn it 90 degrees.



(5) Pull out the toner cartridge drive unit about 30 degrees and take it off toward the direction of the arrow.

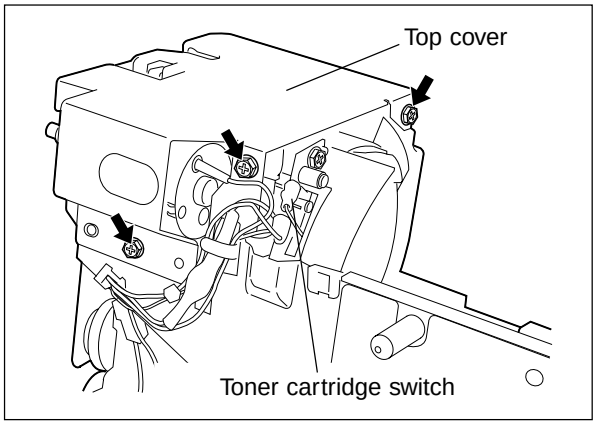


(A-2) Toner cartridge switch

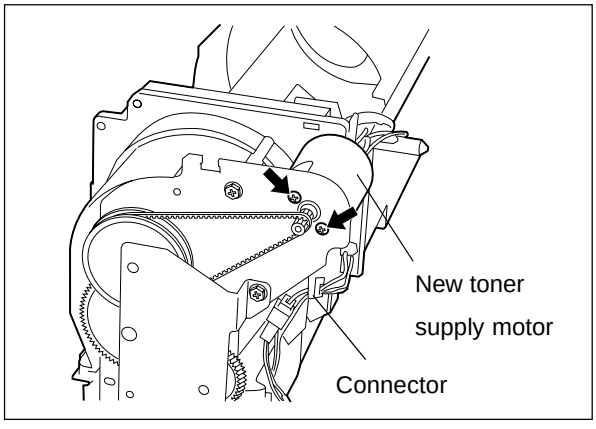
(1) Disconnect 2 connectors, remove 2 screws and take off the toner cartridge switch.

(A-3) New toner supply motor

(1) Remove 3 screws and take off the top cover.



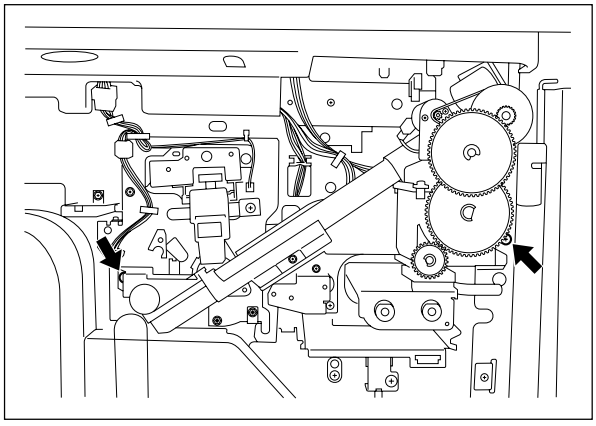
(2) Disconnect 1 connector, remove 2 screws and take off the new toner supply motor.



[B] Toner recycle unit

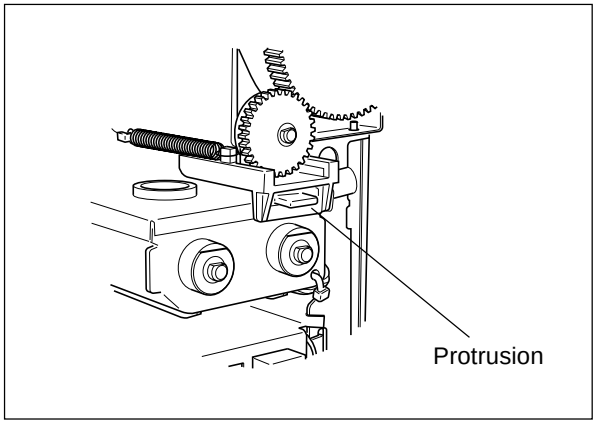
(B-1) Toner recycle unit

(1) Remove the toner cartridge drive unit.
(2) Remove 2 screws and take off the toner recycle unit.



Notes: 1. Be careful when treating this unit because the toner is liable to be spilled out from the connecting section among the toner recycle unit, cleaner unit and developer unit.

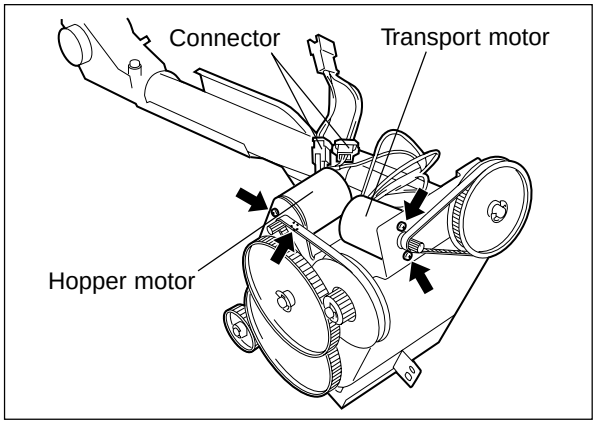
2. When installing the toner recycle unit, put the window of the toner recycle unit shutter section and boss protrusion of the devel oper unit together.



3. Be careful not to give vibrations as less as possible when removing/installing the toner recycle unit, for they may cause stains on images. Especially, the images are more likely to be stained when the remaining toner in the toner cartridge is decreased.

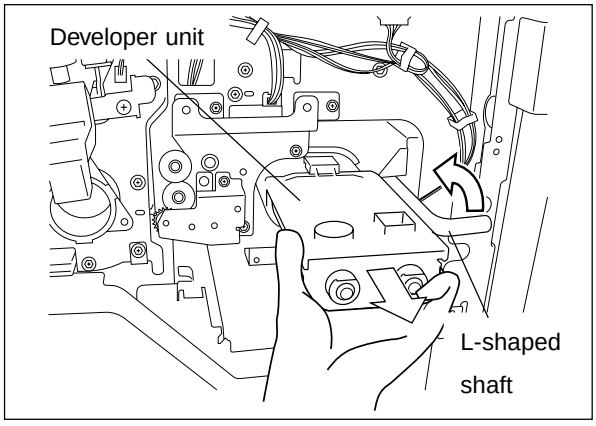
(B-2) Recycle toner transport motor/Hopper motor

(1) Disconnect 2 connectors.
(2) Remove 2 screws and take off the transport motor.
(3) Remove 2 screws and take off the hopper motor.



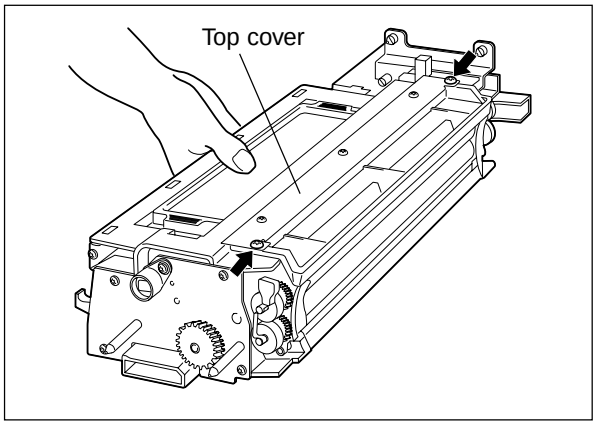
[D] Developer unit

(1) Remove the toner cartridge drive unit and toner recycle unit.
(2) Turn the L-shaped shaft upward to release the lock.
(3) Disconnect 1 connector and pull out the developer unit to the front side.

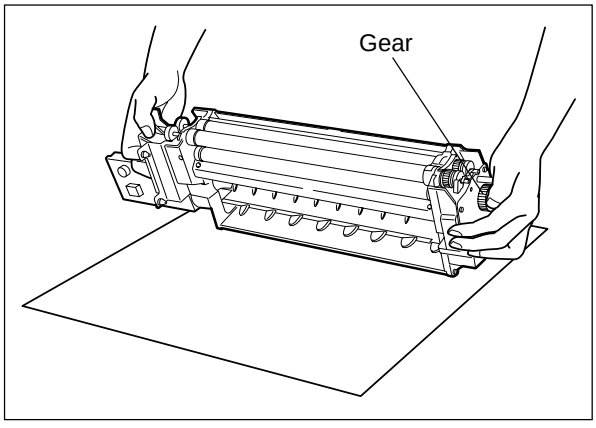


[E] Developer material

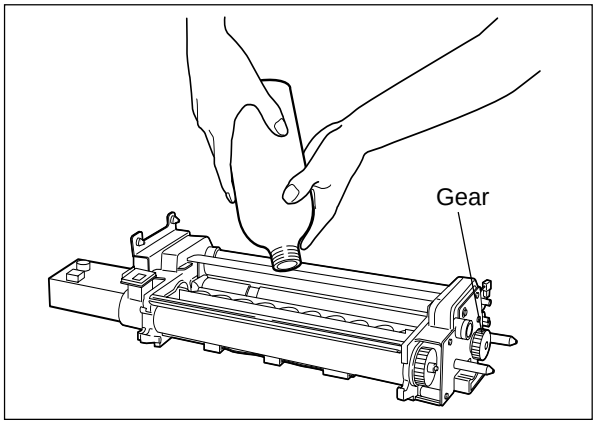
(1) Remove the developer unit.
(2) Remove 2 screws and take off the top cover.



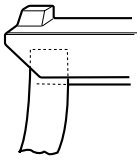
(3) Tilt the developer unit and get out the developer material with turning the rear side gear.

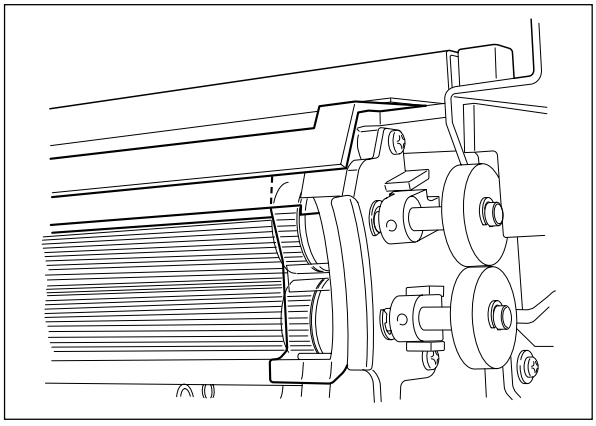


(4) Put in a new material.
(5) Turn the rear side gear several times to uniform the material.



Note: When installing the top cover, insert the latches completely and be careful not to catch up the urethane seal. Also, pay attention to the lap of the urethane sheets.

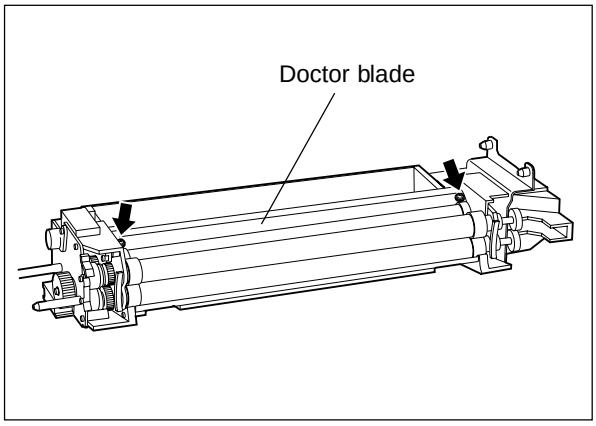




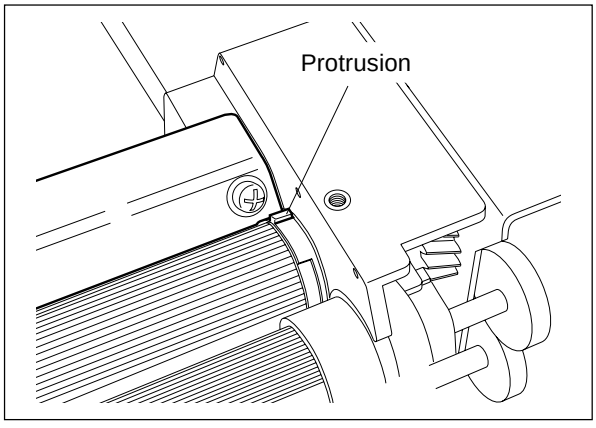
[F] Doctor blade

(1) Remove the developer material.

(2) Remove 2 screws and take off the doctor blade.



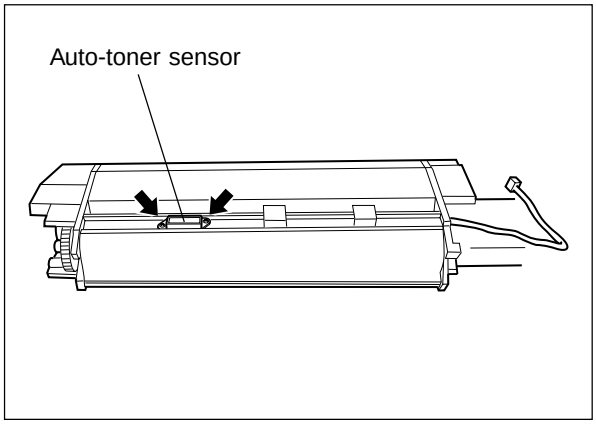
Note: When installing the doctor blade, put the both edges of it against the protrusions at the front and rear side frames, and tighten up the screws to fix it.
This procedure makes it unnecessary to adjust the doctor-sleeve gap.



[G] Auto-toner sensor

(1) Remove the developer material.

(2) Remove 2 screws and take off the auto-toner sensor.

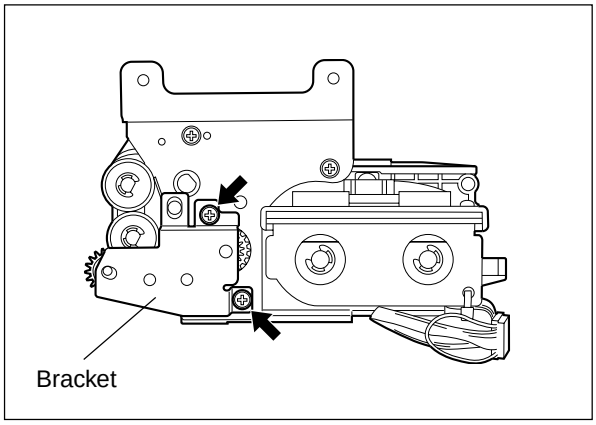


[H] Guide roller

(1) Remove the developer unit.

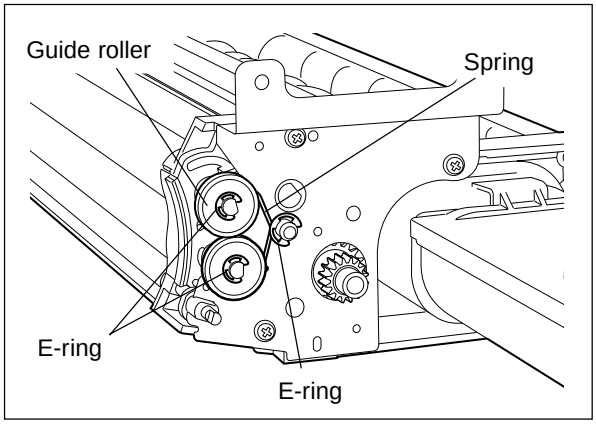
(H-1) Front side

(2) Remove 2 screws and take off the bracket and 3 gears.



(3) Remove 1 E-ring and take off the spring.

(4) Remove 2 E-rings and take off 2 guide rollers.

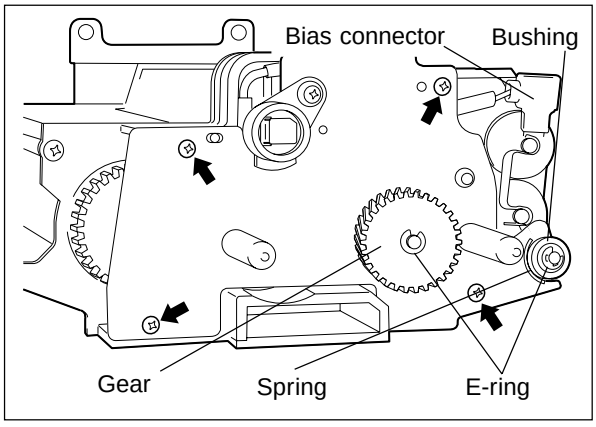


(H-2) Rear side

(5) Remove 1 E-ring and take off the gear.

(6) Remove 1 E-ring and 1 spring and take off the bushing.

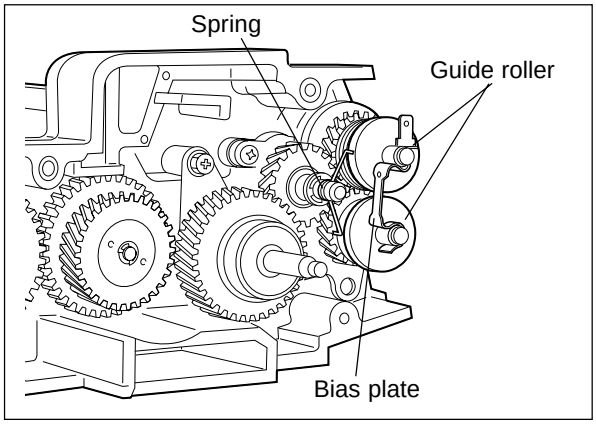
(7) Remove 4 screws, take off the rear side frame and disconnect the bias connector.



(8) Remove the bias plate and spring.

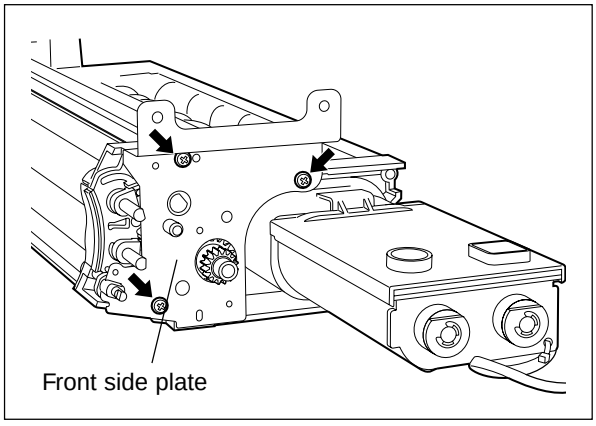
(9) Remove 2 E-rings and take off 2 guide rollers.

Note: When installing the guide roller, pay attention to its color (upside: white, downside: black).

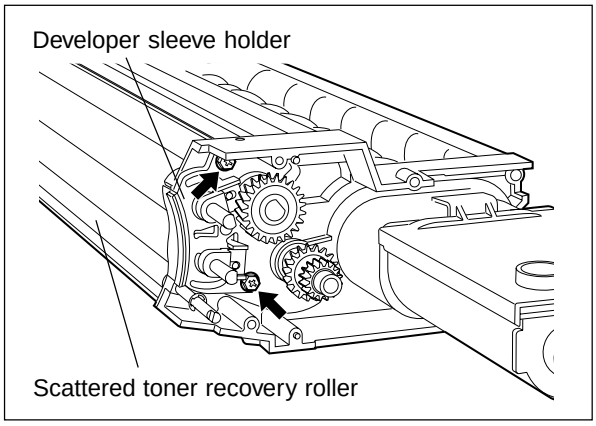


[I] Scattered toner recovery roller/Developer sleeves (magnetic roller)

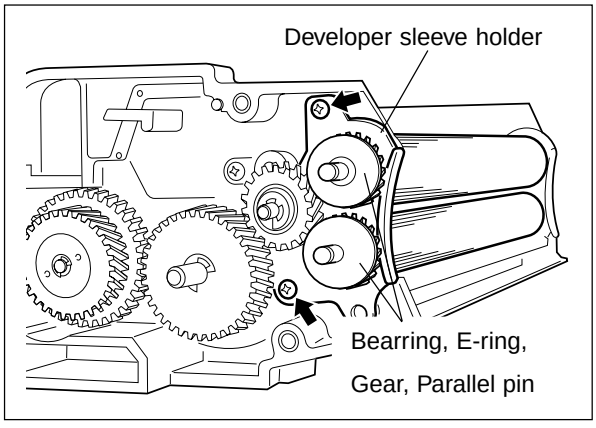
(1) Remove 3 screws and take off the front side plate.



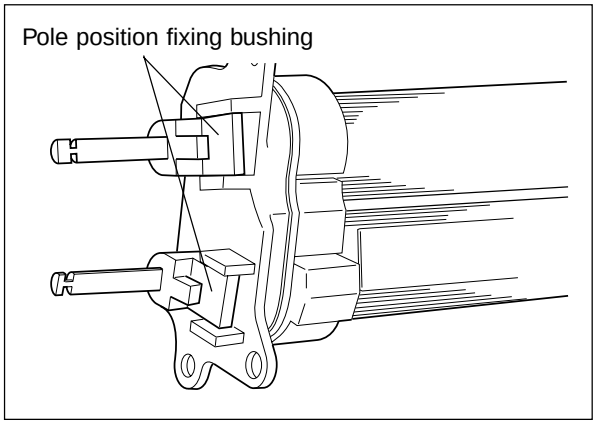
(2) Remove the scattered toner recovery roller.
(3) Remove 2 screws of the front side developer sleeve holder.



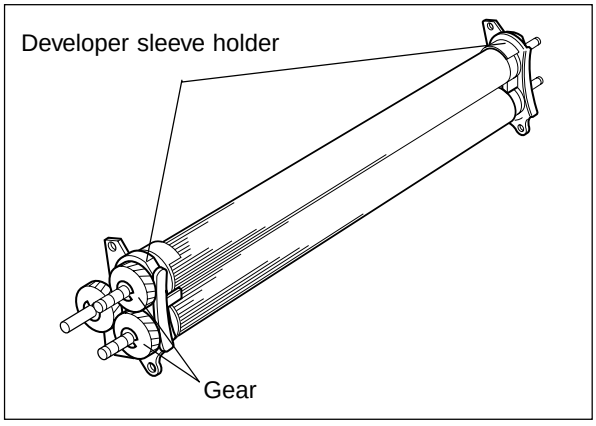
(4) Remove the bearing and E-ring and take off the gear and parallel pin.
(5) Remove 2 screws of the rear side developer sleeve holder.
(6) Remove both the upper and lower developer sleeves with the holders.



(7) Take off 2 pole position fixing bushings and remove 2 E-rings.

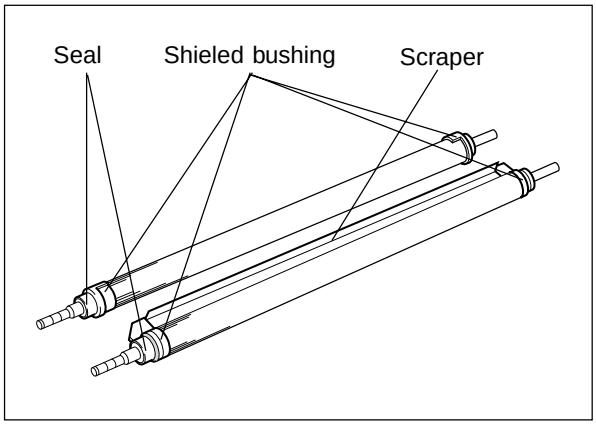


(8) Remove 4 E-rings and take off 2 gears.
(9) Take off the developer sleeve holders at both the front and rear sides.



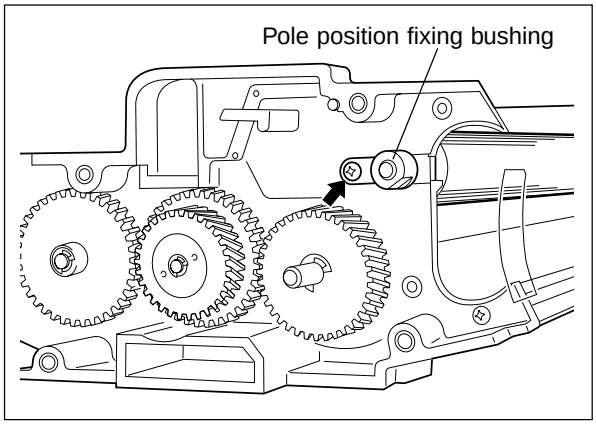
(10) Remove 2 seals, 4 shield bushings and the scraper and take off both the upper and lower side developer sleeves.
(11) If necessary, replace the oil seals that are pressed in 2 rear side shield bushings.

* Procedure for replacing an oil seal: ► Page 12-20



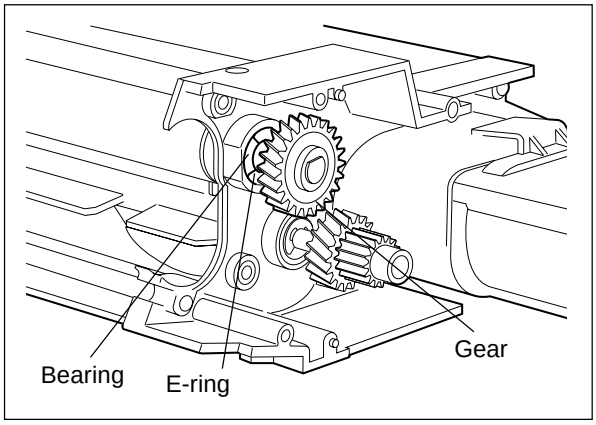
[J] Transport sleeve

(1) Remove 1 screw and take off the rear side pole position fixing bushing.



(2) Remove the front side gear, E-ring and bearing and pull out the transport sleeve.
(3) If necessary, replace the oil seal that is pressed in the front side of the frame.

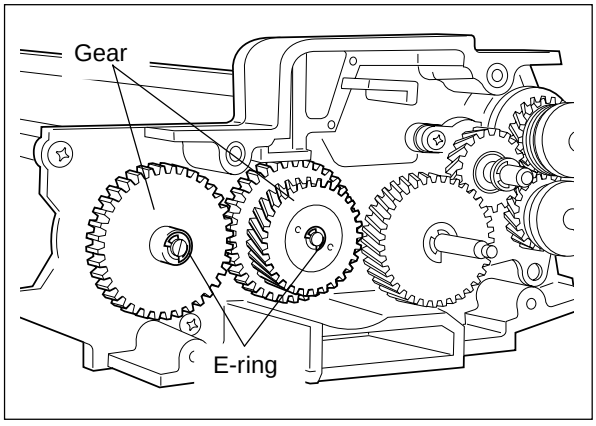
* Procedure for replacing an oil seal: ► Page 12-20



[K] Mixer

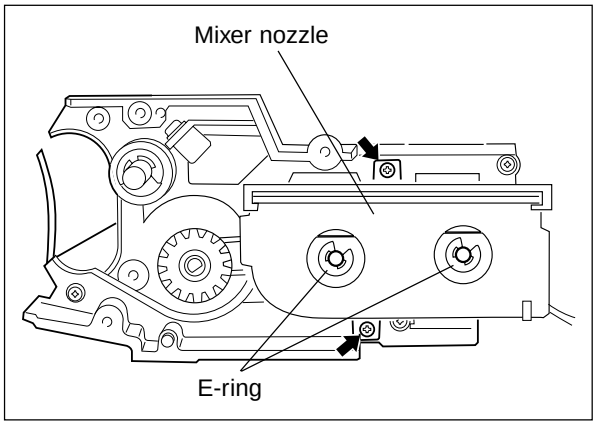
(1) Remove the auto toner sensor.
(2) Remove 2 E-rings and take off 2 rear side gears.
(3) If necessary, remove 2 bearings and replace 2 oil seals that is pressed in the frame.

Note: When installing the bearing, install it after spreading the grease (Albania No.2) all round the mixer shaft.



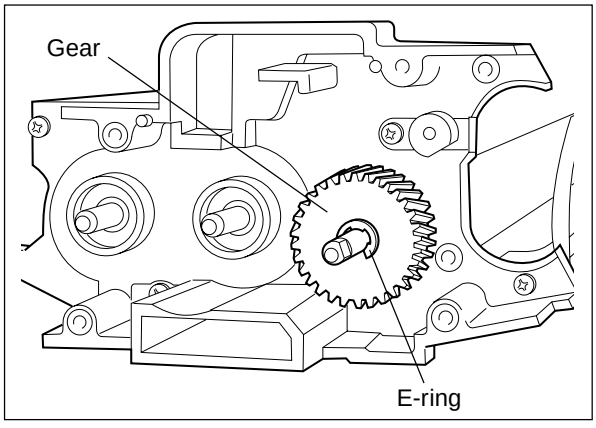
(4) Remove 2 E-rings and 2 screws and take off the front side mixer nozzle.
(5) Pull out 2 mixers.
(6) If necessary, replace the oil seal that is pressed in the mixer nozzle.

* Procedure for replacing an oil seal: ► Page 12-20

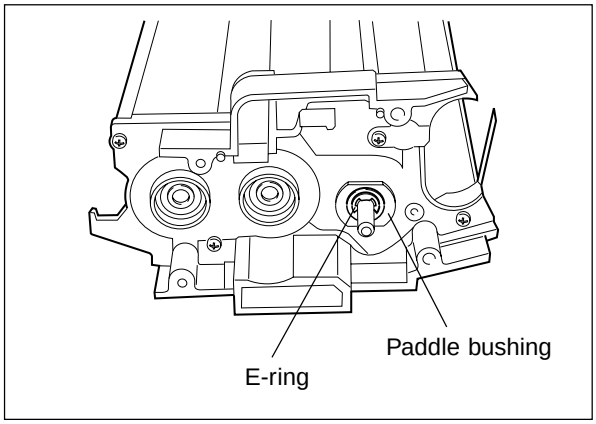


[L] Paddle

(1) Remove 1 E-ring and take off the rear side gear and parallel pin.

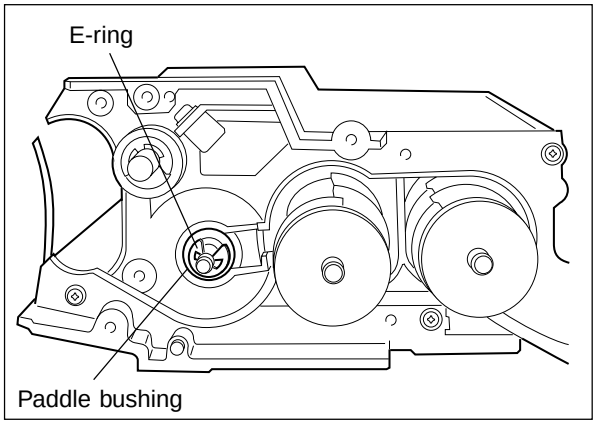


(2) Remove 1 E-ring and pull out the rear side paddle bushing.
(3) If necessary, replace the oil seal that is pressed in the paddle bushing.



(4) Remove the gear and 1 E-ring and take off the front side paddle bushing.
(5) If necessary, replace the oil seal that is pressed in the paddle bushing.
(6) Pull out the paddle.

* Procedure for replacing an oil seal: ► Page 12-20



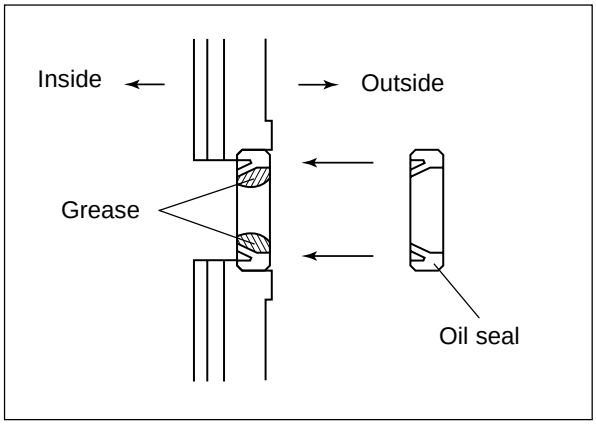
<<Procedure for replacing an oil seal>>

In the developer unit, the oil seals are used at the following 9 places.

- Rear side of the upper and lower developmer sleeves (1pc. for each)
- Front side transport sleeve (1pc.)
- Rear and front sides of the mixer (2pcs. for each)
- Rear and front sides of the paddle (1pc. for each)

An oil seal is replaced by the following steps.

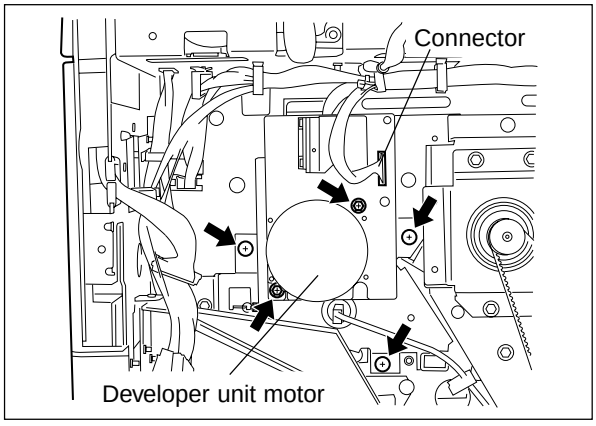
1. Take off the oil seal by hooking out its inside with a fine driver and such.
2. Push in a new oil seal parallel to the frame, bushing and so on with paying attention to its direction (as shown by the right figure).
3. Spread the grease (Albania No.2; about 2-rice-grain's amount) all round the inside diameter.



Note: Wipe off the grease which has run off to the inner side of the oil seal.

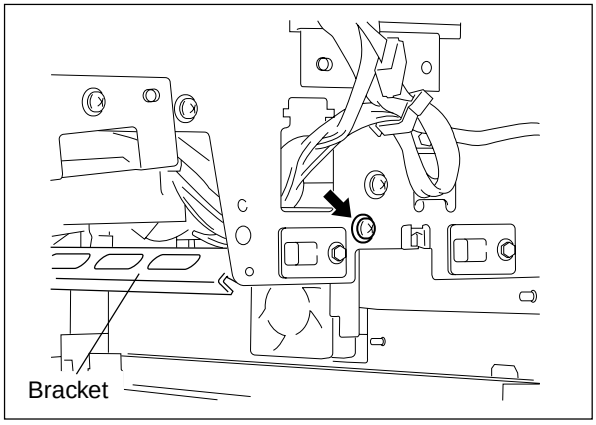
[M] Developer unit motor

(1) Remove the rear cover.
(2) Remove the SYS board and hard disk with the bracket.
(3) Disconnect 1 connector, remove 3 screws, and take off the developer unit motor with the bracket.
(4) Remove 2 screws and release the motor from the bracket.

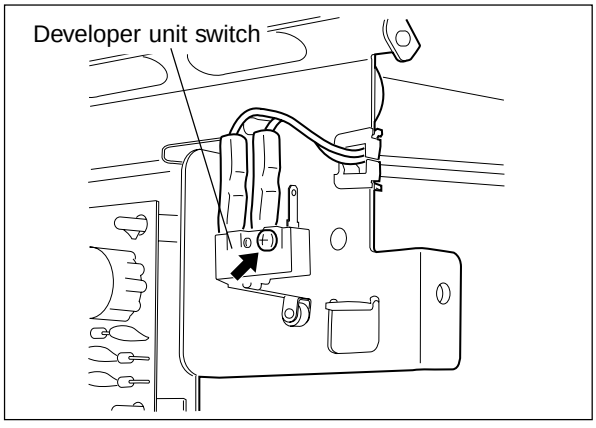


[N] Developer unit switch

(1) Remove the developer unit, main charger, cleaner unit and control panel bottom cover.
(2) Disconnect 1 connector, remove 1 screw and take off the bracket.

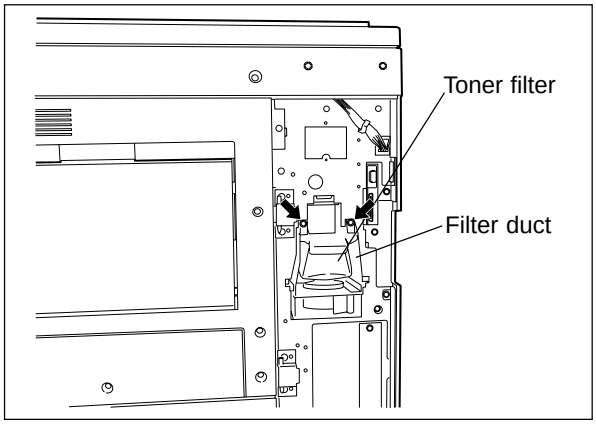


(3) Disconnect 2 connectors, remove 1 screw and take off the developer unit switch.



[O] Toner filter unit

(1) Remove the feed side rear cover.
(2) Pull out the toner filter.
(3) Remove 2 screws and pull out the filter duct.
(4) Disconnect 1 connector of the fan.
(5) Remove 3 screws and take off the fan.



13. TRANSFER/TRANSPORT UNIT

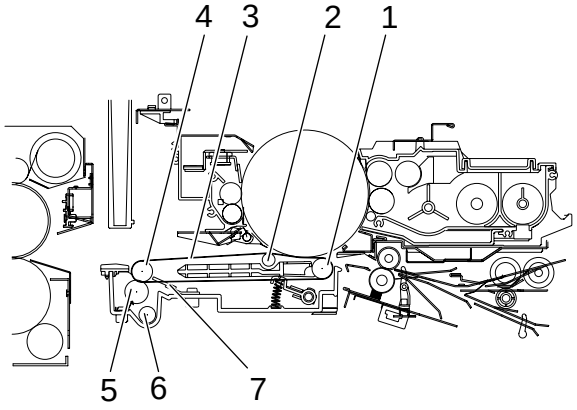
13. 1. General Description
13. 2. Operation
13. 3. Functions
13. 4. Disassembly and Replacement

13. TRANSFER/TRANSPORT UNIT

13. 1. General Description

Transfer/Transport unit consists of the transfer belt unit, fuser unit and transport path through which a duprex printing is carried out.

This chapter excludes the description of the fuser unit.



No.	Name
1	Follower roller
2	Power supply roller
3	Transfer belt
4	Transfer belt drive roller
5	Cleaning blush
6	Recovery auger
7	Cleaning blade

Fig. 1 Belt transport unit sectional view

13. 2. Operation

① While the copier is ready, the transfer belt stands by at a position separated from the photosensitive drum.

② When printing starts, the transfer belt is lifted and held in contact against the photoconductive drum.

③ Voltage from the high-voltage transformer unit is applied to the transfer belt via the power supply roller.

④ As the surface of the transfer belt is electrified by a plus voltage by dielectric polarization, the paper is held in contact by static electricity, and the processes of transfer, separation, and paper transport can be carried out continuously.

⑤ After printing ends, the transfer belt is lowered and separated from the photoconductive drum to stand by again.

13. 3. Functions

(1) Transfer belt unit

The transfer belt is coated with a high-precision flat rubber belt and has electrical resistance. The transfer belt unit is divided into a belt support/power supply section and a cleaning mechanism. The belt support/power supply section supports the belt and rotates to supply power, and the cleaning mechanism scrapes of toner from the belt surface.

(2) Transfer belt support/power supply mechanism

As shown in Figure 1, the transfer belt is supported by 3 rollers (transfer belt drive roller, follower roller and power supply roller). Voltage having a polarity opposite to that of the toner on the photoconductive drum is applied to the power supply roller. The current flowing to the transfer belt is controlled to a constant current of 80µA. (Though the applied voltage changes as current is constant, the voltage change is normally within the range +2 to +5kV.) +510 voltage is applied to the follower roller by the varistor. A voltage probe is required for measurement. To prevent danger, do not use a digital voltmeter.

(3) Transfer belt cleaning mechanism

The cleaning mechanism has two functions, a function for scraping off residual toner and paper dust from the belt surface by the cleaning blade and cleaning brush and transporting the used toner with the recovery auger, and a function for bringing the transfer belt into contact with and separating from the drum.

(4) Cleaning blade

After the paper is separated, the cleaning blade removes paper dust and foreign matter remaining on the belt surface.

(5) Cleaning brush

The cleaning brush is electroconductive for electrostatically cleaning the toner. A voltage opposite to that of the toner is applied to the toner. The current flowing to the brush is controlled to a constant current of 5µA. (Though the applied voltage changes as current is constant, the voltage change is normally within the range +100 to +500V.) A voltage probe is required for measurement. To prevent danger, do not use a digital voltmeter.

(6) Recovery auger

The recovery auger transports the scraped toner to the used toner transport auger section.

(7) Transport guide

The transport guide guides the paper that is held in contact by static electricity to the fuser unit. It is made of the material that prevents electrification caused by the friction with the paper.

(8) Belt transport unit lock/unlock mechanism

The belt transport unit is locked inside the copier. It is structured in such a way that it is locked when a paper jam is cleared, and can be drawn out towards you.

The belt transport unit has a function for separating the transfer belt from the drum and a function for preventing erroneous operation of the handle when it is drawn out.

- When the handle is rotated clockwise when viewed from the front, the belt transport unit can be drawn out horizontally.
- When the belt transport unit is inserted into the copier and the handle is rotated in counterclockwise as seen from the front, the unit (at the vertical position) is locked.
- If the belt transport unit is not completely inserted into the copier, the handle cannot be rotated from the horizontal position.

(9) Damp heater (for preventing condensation)

The damp heater is located under the transfer belt, and is powered when the main power switch is turned OFF.

Standard accessories: TWD, SAD, ASD, AUD

Options: Other than the above

(10) Transfer belt drive unit

Drive is transferred from the transfer belt motor, travels via the timing belt and the relay gears, and is transmitted to the transfer belt drive gear to rotate the drive roller. Drive is transmitted to the belt transport unit via a gear having a planetary joint.

(11) Transfer belt contact/release mechanism

This mechanism has two functions: separating the transfer belt from the photoconductive drum when a jam occurs and bringing the transfer belt in touch with it when copying is started.

- The rotation of cam by a driving force, which has been transmitted by the gear from the cam motor, makes the rear side lever in the transfer belt move up and down.
- The transfer belt is separated from/brought in touch with the photoconductive drum by handling the lever vertically.
- The cam phases are controlled by two sensors.

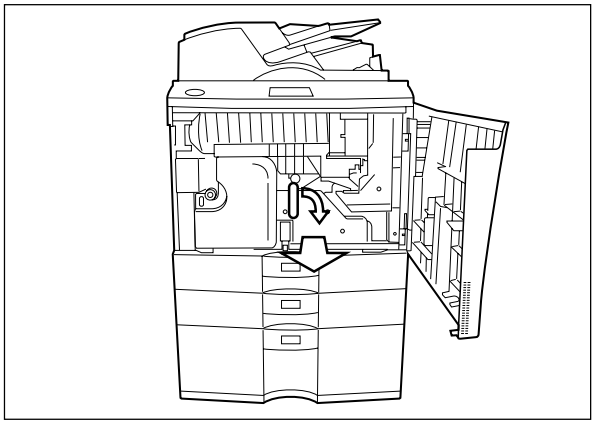
(12) Duplex printing transport section

When carrying out a duplex printing, reversed paper goes through this section.

13. 4. Disassembly and Replacement

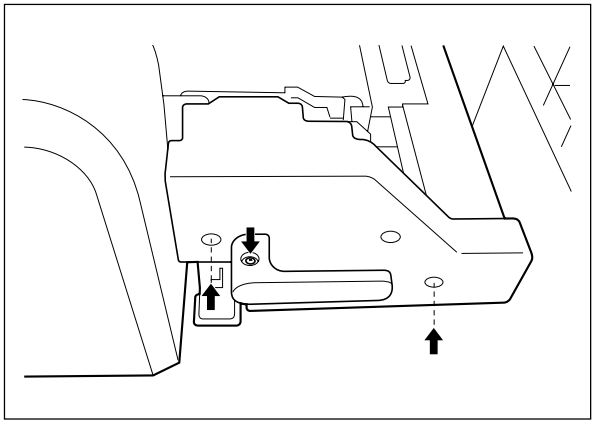
[A] Transfer belt unit

(1) Open the front cover, turn the handle clockwise and pull out the transfer/transport unit.

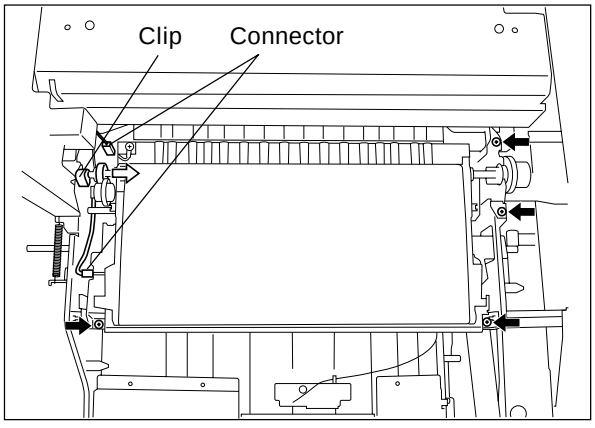


(2) Remove 1 screw and take off the hundle.

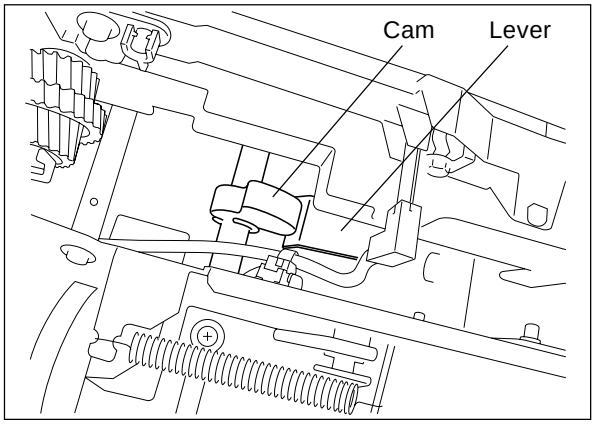
(3) Remove 2 screws and take off the cover.



(4) Disconnect 2 connectors, remove 1 clip and take off the front side bearing. Then remove 4 screws and take off the transfer belt unit.



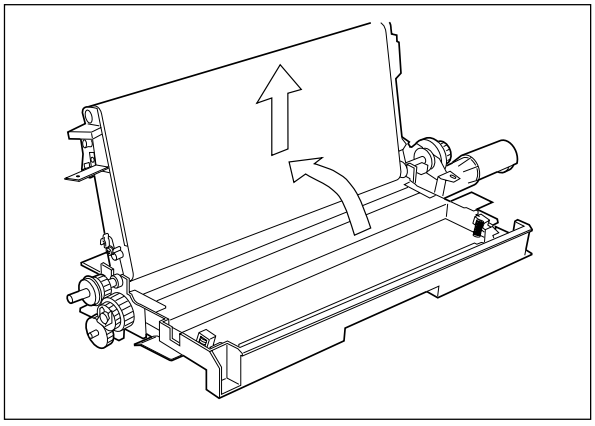
Note: When installing the transfer belt unit, install it as the lever comes under the cam.



[B] Transfer belt

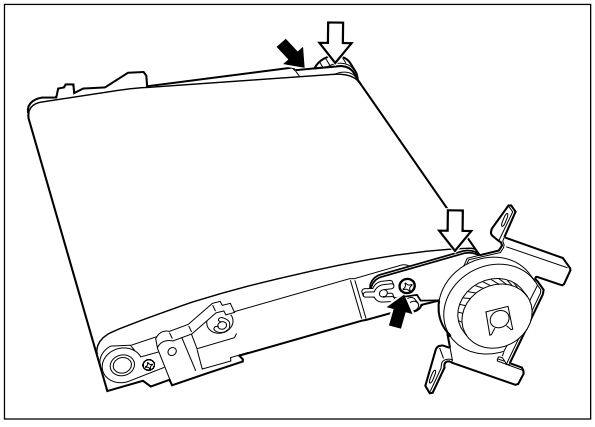
(1) Remove the transfer belt unit.

(2) Turn the transfer belt keeping/feeding section 90 degrees and pull it out upward.



(3) Remove 2 screws.

Note: When tightening up the screws, tighten them so that the link plate is securely fixed by pushing it toward the direction of the white arrows.

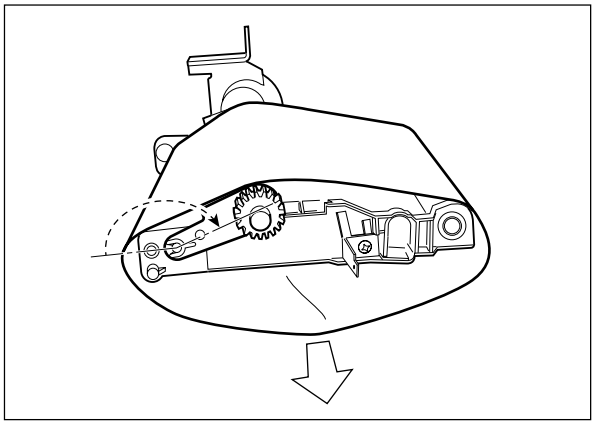


(4) Turn the drive roller as the picture shows.

(5) Pull out the transfer belt.

Notes: 1. When installing the transfer belt, install it at the center not to be moved aside.

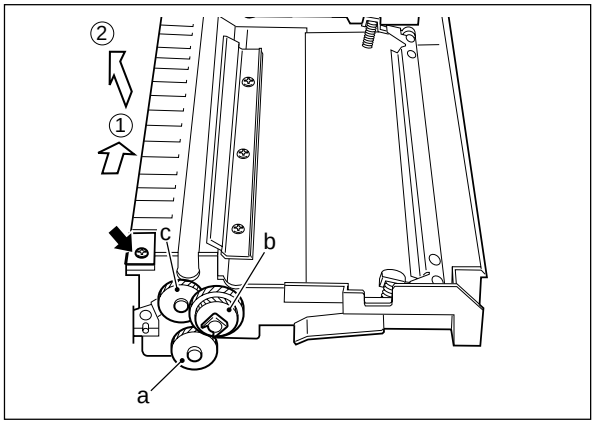
2. Do not touch the surface of the belt with bare hands.



[C] Brush

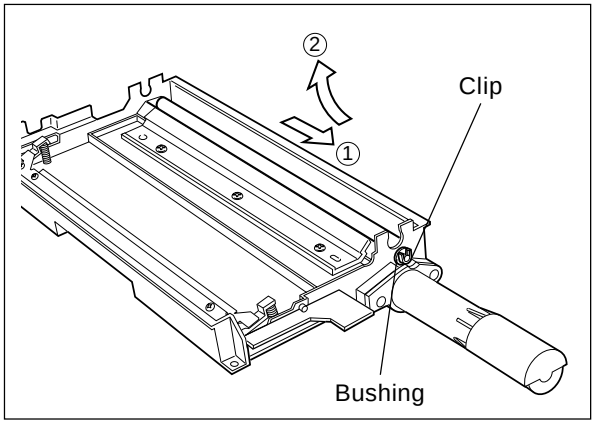
(1) Remove the transfer belt keeping/feeding section.
(2) Remove 1 screw and take off the plate spring.
(3) Move the transport guide to the rear side and pull it out upward.
(4) Remove 1 clip and take off 3 gears.

Notes: 1. The gears a/c has a latch, and remove the gears in the order a, b, c.
2. When installing each gear, make sure the latch fits into the groove portion of the shaft.



(5) Remove 1 clip and take off the bushing.
(6) Push the brush to the rear side, take off the front side shaft and pull out the brush upward.

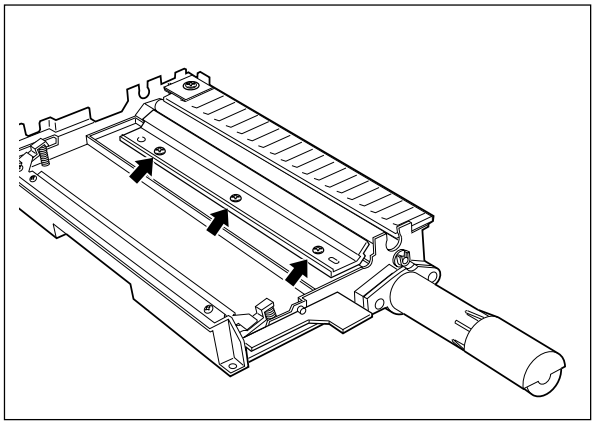
Note: Do not touch the top of the brush with bare hands.

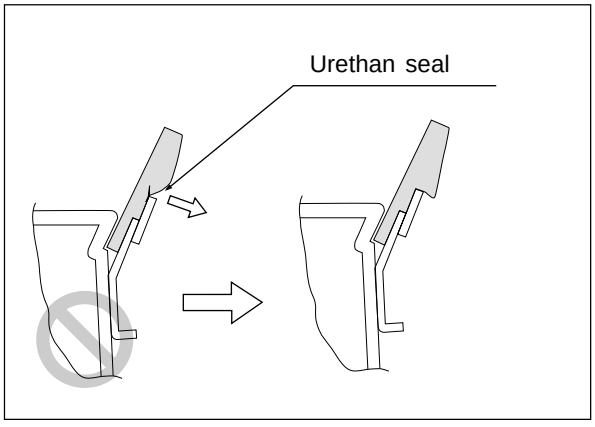


[D] Cleaning blade

(1) Remove the transfer belt keeping/feeding section.
(2) Remove 3 screws and take off the cleaning blade.

Notes: 1. When installing the cleaning blade, make sure that both sides of the bosses are fit in and screwed shut.
2. Do not touch the blade with bare hands and make any scar on it.
3. Be careful not to mash the urethan seals at both sides.





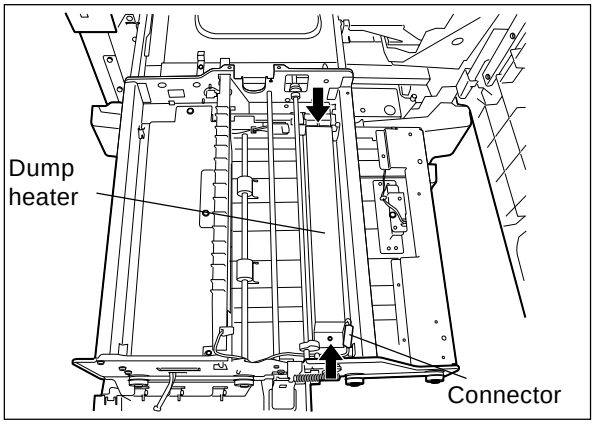
JUNE 2002 © TOSHIBA TEC

[E] Damp heater

(1) Remove the transfer belt unit.

(2) Remove 2 screws, disconnect 1 connector and take off the damp heater.

Note: When installing the dump heater, be careful not to catch it in the harness.

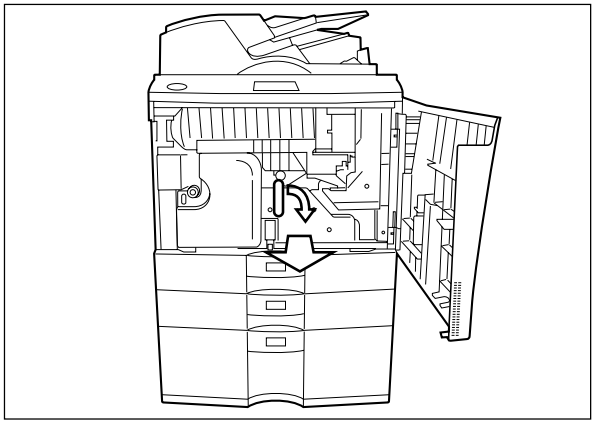


[F] Transfer/Transport unit

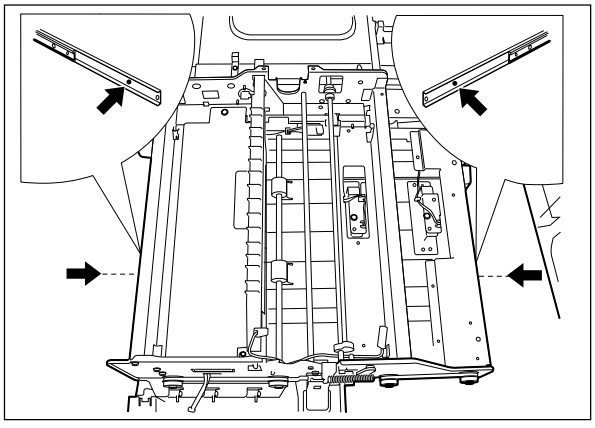
(1) Open the front cover, turn the lever clockwise and pull out the transfer/transport unit.

(2) Remove the fuser unit and transfer belt.

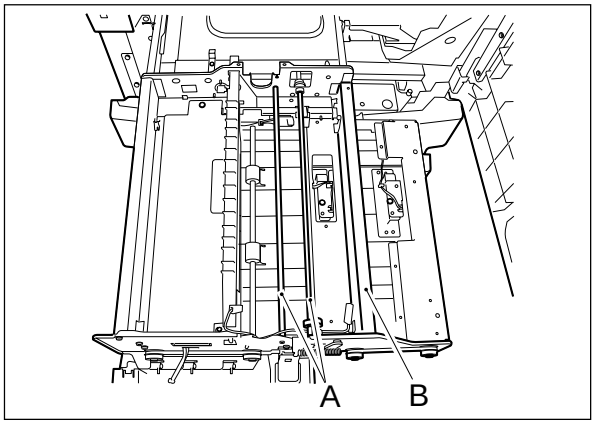
Note: When removing the transfer/transport unit, remove each unit after removing the fuser and transfer belt units.



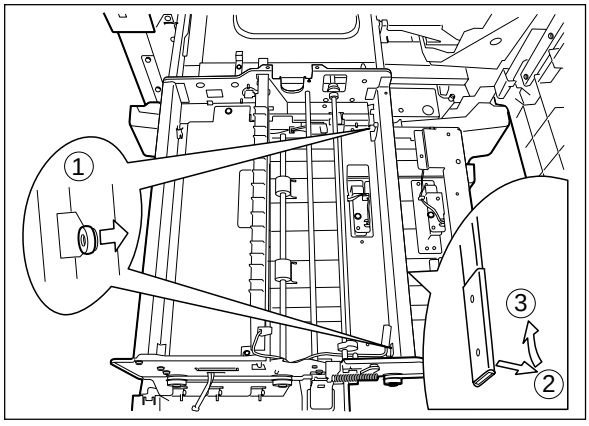
(3) Remove 2 shoulder screws fixed at both sides slide rails.



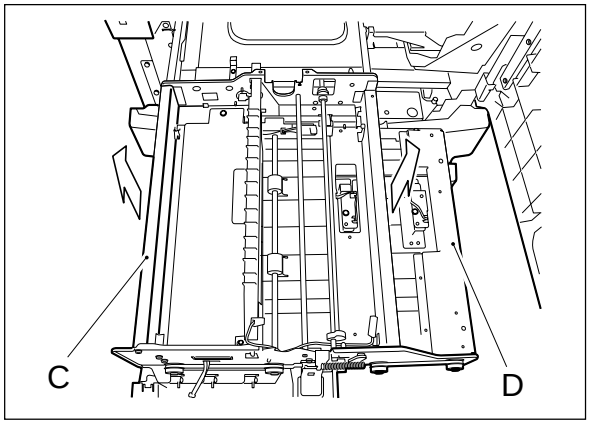
(4) Hold the A(shaft) or B(stay) section with the left hand and the right slide rail with the right hand.



(5) ① Lift the transfer/transport belt unit and take off the catch-up section.
② Slack off the right slide rail a little.
③ Push the rail to the inside of the unit.

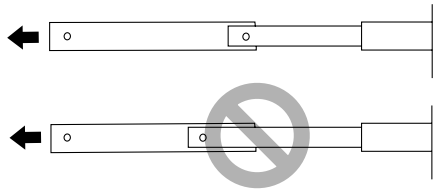


(6) Change the A or B section to the right hand and hold the C section with the left hand. Then lift the transfer/transport unit and take it off.



Notes: 1. Since the guide is sometimes transformed when being pressured, be careful not to hold the D section when lifting the transfer/transport unit.

2. Take the following steps when installing the transfer/transport unit.
   1) Pull out only the left slide rail.
   2) Hang the transfer/transport unit on the left slide rail firmly.
   3) Extend the right slide rail fully, especially, its leading edge.

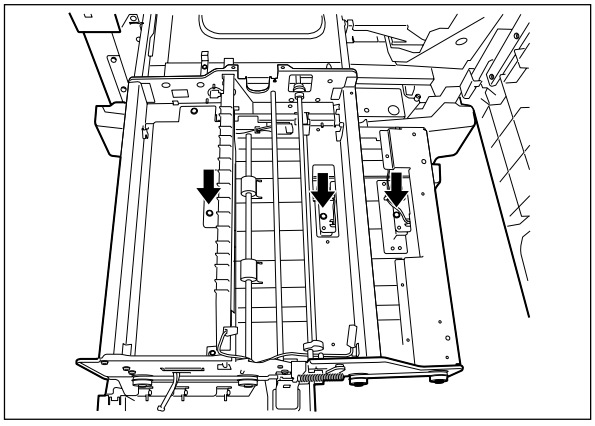


   4) Hang the transfer/transport unit on the right slide rail firmly.
   5) Fix the transfer/transport unit with 2 shoulder screws.
   6) Follow the reverse procedure of disassembling afterwards.

[G] Transport detection sensor

(1) Remove the transfer belt and fuser unit.

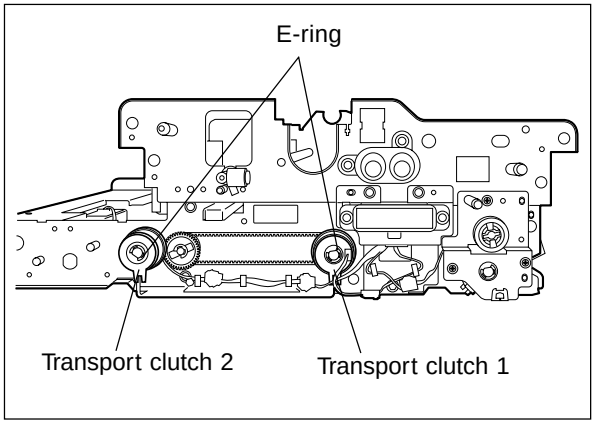
(2) Disconnect 1 connector, remove 1 screw and take off each sensor.



[H] Transport clutch

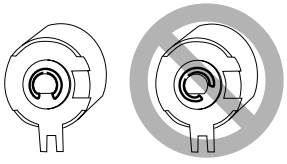
(H-1) Transport clutch 1, 2

(1) Disconnect 1 connector, remove 1 E-ring and take off each transport clutch.



Notes: 1. When installing the clutches, pay attention to the color of harness.

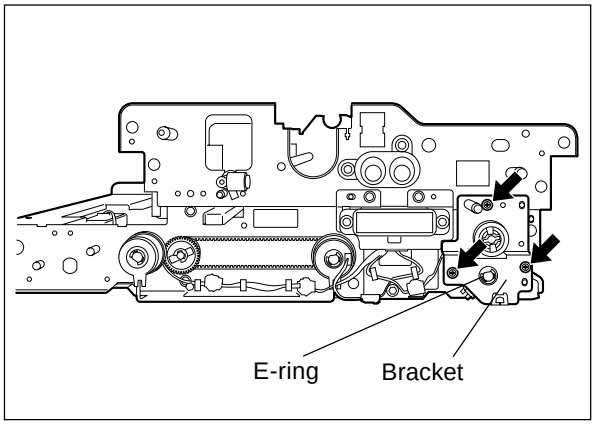
2. Make sure that the E-rings are tightly fit not to be loosen and one end of E-ring does not ride too much on the flat part of shaft.



(H-2) Drive clutch

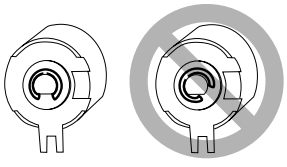
(1) Remove 1 E-ring and 3 screws and release the bracket.

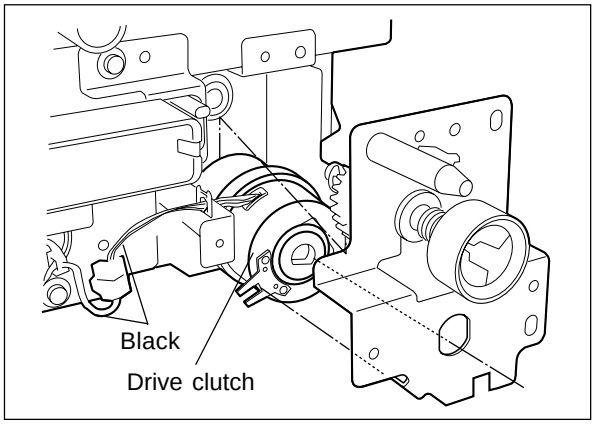
(2) Disconnect 1 connector and take off the drive clutch.



Notes: 1. When installing the clutches, pay attention to the color of harness.

2. When fitting the E-rings on the clutches, make sure that the latches of E-ring do not protrude on the flat part of shaft.



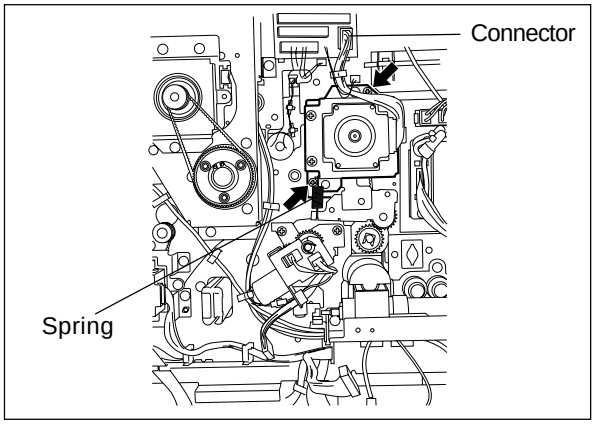


[I] Transfer belt drive motor unit

(1) Remove the rear cover and take off the flywheel.

(2) Disconnect 1 connector, remove 1 spring and 2 screws and take off the drive motor unit.

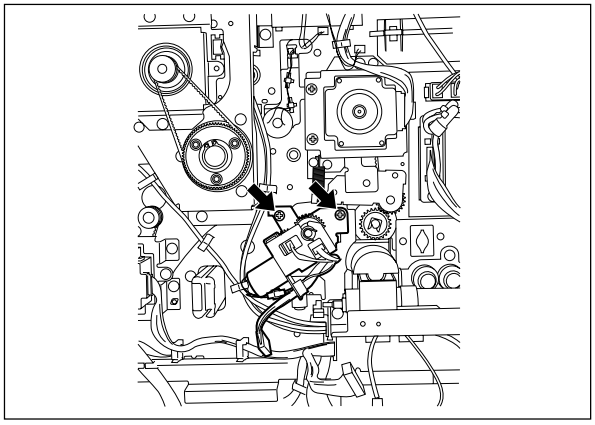
Note: When installing the motor, rotate it counterclockwise to fix.



[J] Transfer belt contact/release cam drive unit

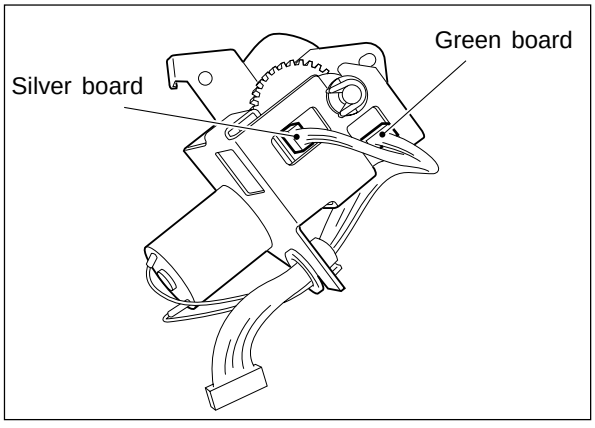
(1) Remove the rear cover and take off the flywheel.

(2) Disconnect 1 connector, remove 2 screws and take off the cam drive unit.



(3) Disconnect the connector and take off 2 sensors.

Note: When replacing each sensor, pay attention to the board color (shown in the right figure) and direction.



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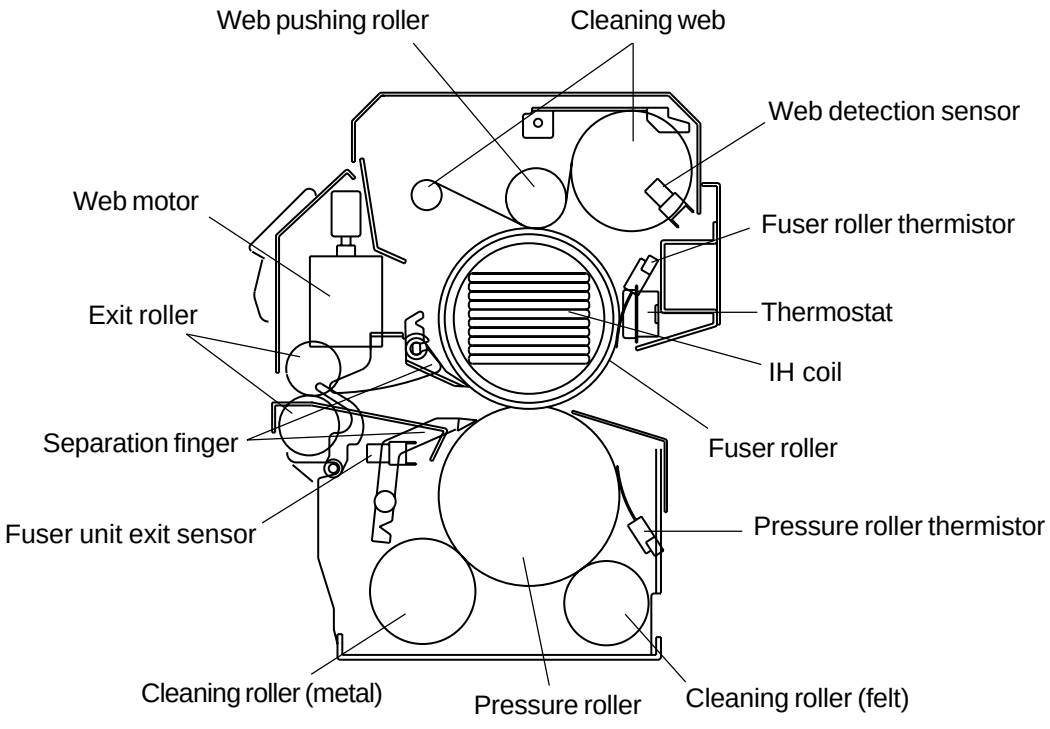
14. FUSER UNIT

14. 1. General Description
14. 2. Operation
14. 3. Functions
14. 4. Heater Control Circuit
14. 4. 1. Configuration
14. 4. 2. Heating principle of IH coil
14. 4. 3. IH control circuit interface
14. 4. 4. IH control circuit abnormalities
14. 4. 5. Temperature detecting section
14. 4. 6. Detection of open-circuited thermistors
14. 5. Fuser Motor Drive
14. 5. 1. Outline of operation
14. 5. 2. Control signals
14. 6. Disassembly and Replacement

14. FUSER UNIT

14. 1. General Description

The toner is fused on the paper separated from the photoconductive drum by applying heat and pressure to it. The paper is then discharged through the paper exit section. The fuser unit consists of the IH coil, fuser roller, pressure roller, separation fingers, cleaning web, cleaning rollers, thermistors, thermostat, exit rollers, exit sensor, etc.



[Sectional view]

14. 2. Operation

At the fuser unit, the toner is fused on the paper which has been separated and transported from the photoconductive drum by applying heat and pressure to it.

The fuser roller is rotated by the driving of the fuser motor and has an IH coil inside, which does not rotate itself. The fuser and pressure rollers are always pressured by a spring force.

After being fused, the paper is separated smoothly from the fuser roller by the separation fingers.

The thermistor detects the fuser roller temperature to control it, and when the temperature becomes abnormally high, which is detected by the thermostat, the power supply to the IH coil is cut off.

14. 3. Functions

(1) IH coil (IH: Induction heating)

The IH coil is inside the fuser roller and applies the induction heat to the fuser roller. This IH coil is divided into two parts, the center IH coil heating the center of the fuser roller and the side IH coil heating both ends of the fuser roller. Those parts become ON/OFF separately to always keep the fuser roller at a certain temperature without wasting excessive electric power.

(2) Fuser roller

The fuser roller is made of iron and induction-heated by the IH coil. It is pressed by the pressure roller, which is mentioned below, and the toner is fused on the peper while the paper is passing through between these two rollers with the toner image on the paper facing the fuser roller. So, the toner soaks into the fibers of the paper by melting it with the heat of the fuser roller and improving the heat conductivity by the pressure from the pressure roller.

The surface of the fuser roller is coated with fluoroplastic to prevent the toner adhering to the roller (the phonomenon called “offset”) and help it separate from the fuser roller.

(3) Pressure roller

The pressure roller is made of rubber to make it easier to press the fuser roller and always pressed by a spring force.

(4) Separation fingers

The separation fingers take off the paper that has stuck to the fuser and pressure rollers.

(5) Cleaning web

The cleaning web is attached in touch with the fuser roller by the web pushing roller to remove the toner and paper dust that have stuck to the fuser roller during the fusing process. It is rolled up by the motor so that its clean surface always touches the fuser roller, and also it contains silicon oil for coating the surface of the fuser roller, which makes it easier to clean up the toner and paper dust on the fuser roller.

(6) Cleaning rollers

The cleaning rollers are attached in touch with the pressure roller to remove the toner and paper dust that have stuck to the pressure roller during the fusing process. There are two kinds of rollers, a metal roller and felt roller. The felt cleaning roller contains silicon oil for coating the surface of the pressure roller, which makes it easier to clean up the toner and paper dust on the pressure roller.

(7) Exit roller

The exit roller of the fuser unit discharges the paper separated from the fuser and pressure rollers with the separation fingers through the fuser unit.

(8) Fuser unit exit sensor

This sensor is for detecting that the trailing edge of the paper has reached the fuser unit exit sensor and also for detecting of paper jams at the fuser unit exit section.

(9) Fuser roller center thermistor/Fuser roller side thermistor (rear)

This thermistor detects the temperature of the fuser roller to maintain it in a certain range, which is higher than the lower limit causing the poor fusing and lower than the upper limit causing the high temperature offset. When the temperature of the fuser roller is lower than the preset temperature, it turns ON the power supply to the IH coil, and when it is higher than the preset temperature, it cuts OFF the supply. It also detects the slight different of the temperatures at the center and rear end of the fuser roller to control ON/OFF of the center and side IH coil to keep the fuser roller at a certain temperature.

(10) Fuser roller side thermistor (front)

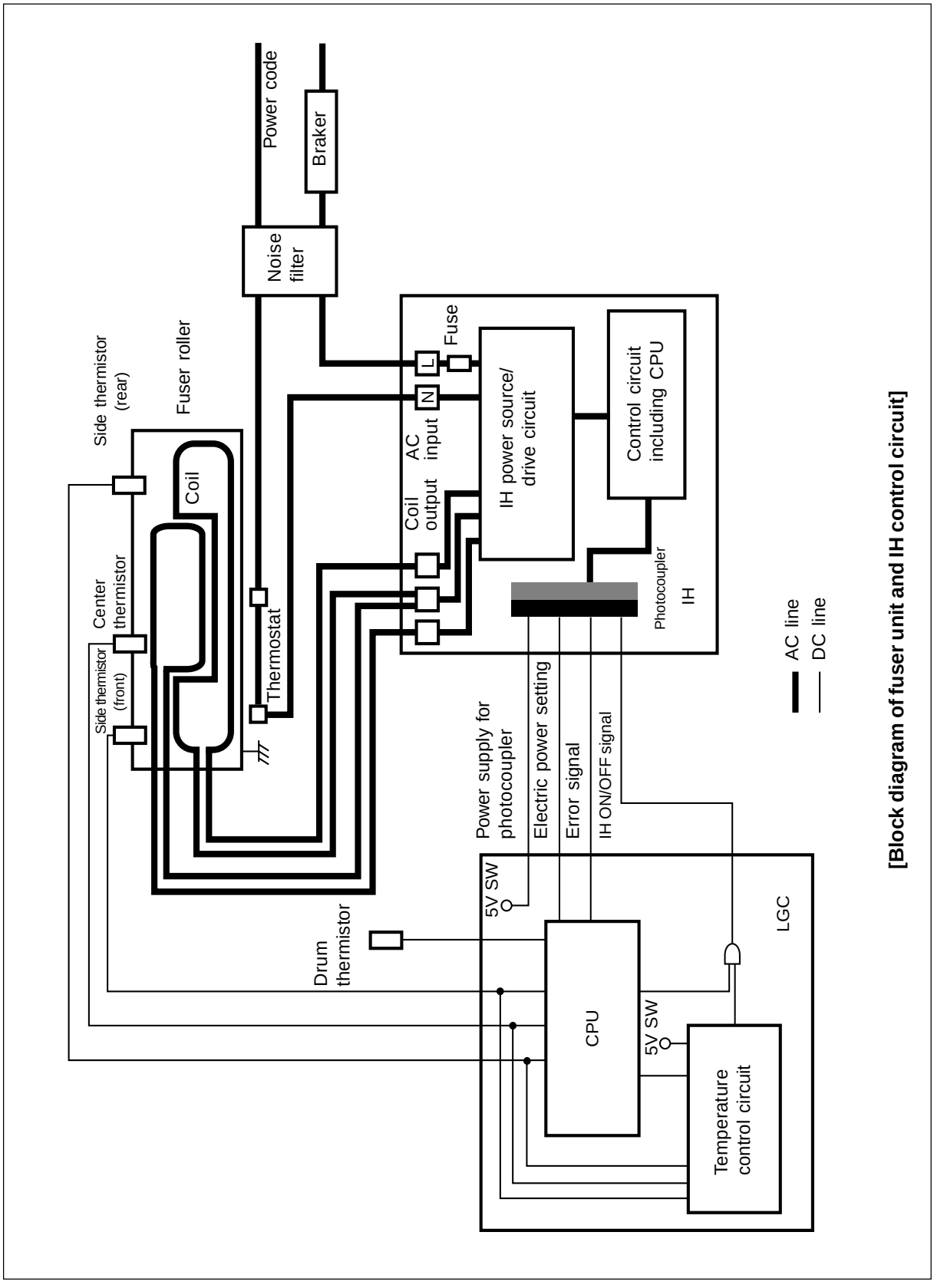
This thermistor cannot be used for the temperature control. It detects a temperature abnormality at the side area of the fuser roller where paper does not pass through.

(11) Thermostats (center, front)

The center and front thermostats cut off the power supply to the IH coil when the fuser roller becomes abnormally hot as the result of a problem such as the thermistor malfunction. The thermostats of this copier are used to prevent abnormal operations, and when they detect any abnormality, they must be replaced altogether with the other damaged parts of the fuser unit.

14. 4. Heater Control Circuit

14. 4. 1. Configuraton

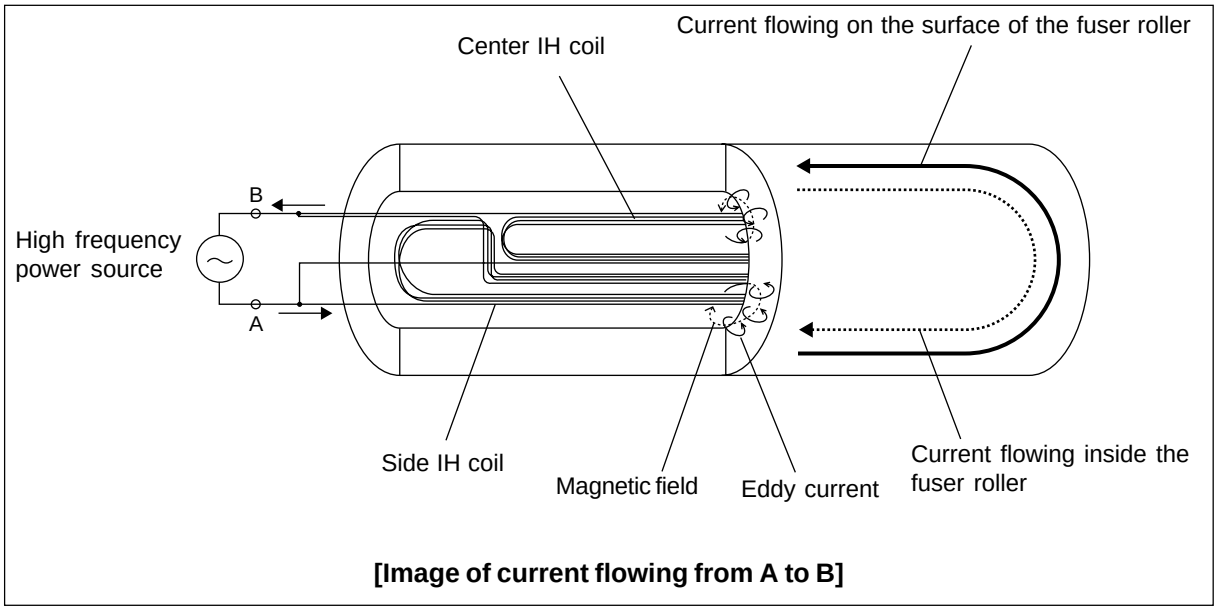


[Block diagram of fuser unit and IH control circuit]

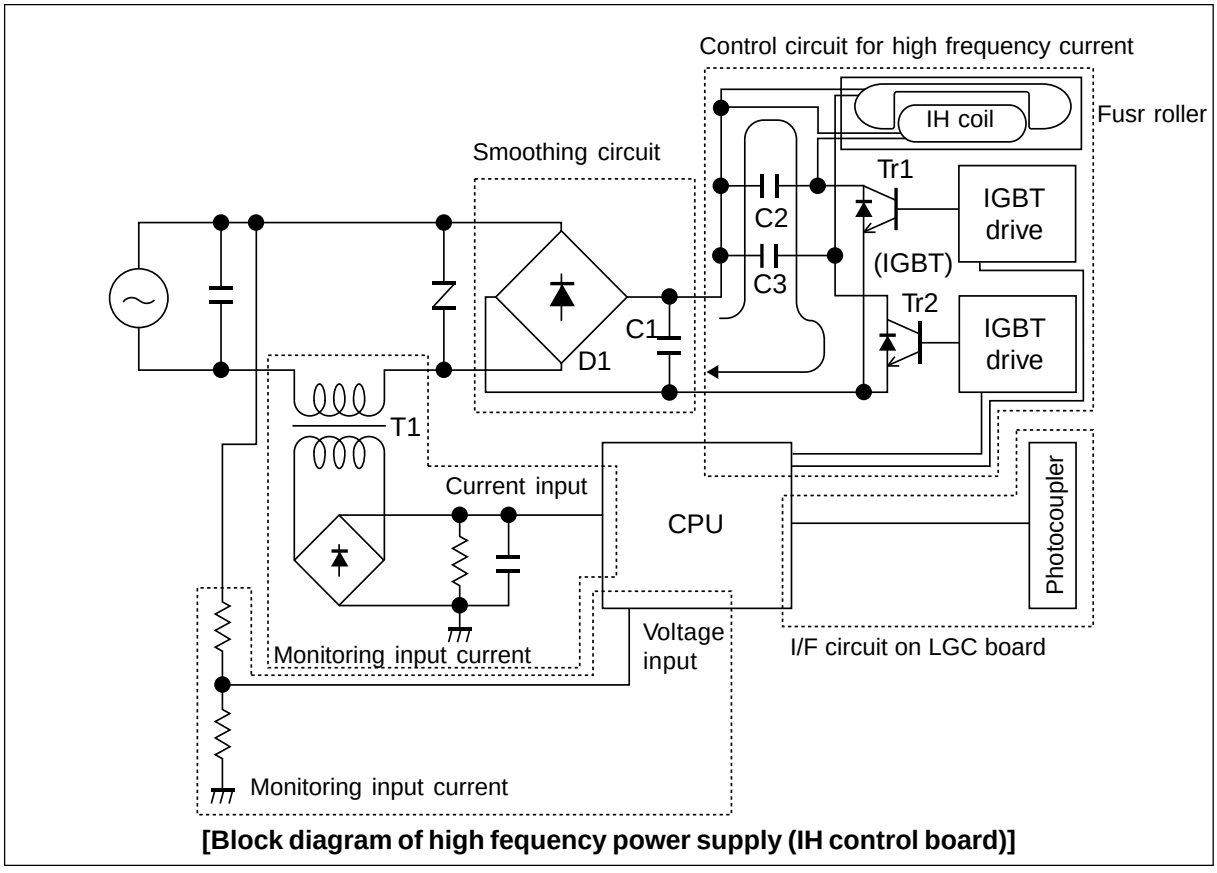
14. 4. 2. Heating principle of IH coil

The magnetic field is generated by applying a high frequency current to the IH coil inside the fuser roller, which then produces the eddy current in it. When the eddy current flows, the Joule heat is generated by the resistance element of the fuser roller, which is then heated. In the IH coil method, the thermal efficiency is higher than the lamp method because the fuser roller is directly heated.

IH coil is divided into two parts to decrease the temperature difference between the center and both ends of the fuser roller.



[Image of current flowing from A to B]



[Block diagram of high fequency power supply (IH control board)]

14. 4. 3. IH control circuit interface

The IH control circuit uses a photocoupler as an insulator against the secondary circuit.

The interface signals are as followed.

Number	Signal	Direction	Definition
J552-1	IH2ON	HOST to IH	OFF signal when the roller ends are heated abnormally
J552-2	5V		
J552-3	H1PWR1	HOST to IH	Electric power setting
J552-4	H1PWR2		
J552-5	H1PWR3		
J552-6	H2PWR1		
J552-7	H2PWR2		
J552-8	H2PWR3		
J553-1	IH1ON	HOST to IH	ON/OFF signal
J553-2	SG		
J553-3	IHDUTY	HOST to IH	ON duty signal
J553-4	IHERR1	HOST to IH	Error signal
J553-5	IHERR2		

14. 4. 4. IH control circuit abnormalities

The IH output is stopped when an abnomlity occurs in the IH control circuit.

(1) When the power voltage of the copier is too high or too low
IH output is stopped to protect the IGBT when the input voltage, which is higher or lower than specified range, is applied to the copier. This is an error [C47].

(2) When the AC is not applied to the IH control circuit
The error that the AC is not applied to the IH control circuit properly is [C47]. The same error occurs when the thermostat is either activated or blown.

(3) When the temperature of the IGBT is too high
Normally, the IGBT is forcibly cooled down as it becomes hot while the power is supplied to the IH control circuit. The error [C48] is occurred when this cooling operation is not sufficient and the IGBT becomes too hot.

(4) When the temperature detection sensor of the IH control circuit is malfunctioning
The error [C49] occurs when the temperature detection sensor is malfunctioning or the IH coil is not connected properly.

(5) When the ON/OFF of IH coil becomes out of control
When an abnormality occurs at the IH control circuit and the ON/OFF of the IH coil becomes out of control, CPU decides the error code and counter value of the fuser roller thermistor error status after detecting the abnormal temperature at the thermistor.

* Abnormal temperature	Center thermistor	: 230°C
	Side thermistor (rear)	: 240°C
	Side thermistor (front)	: 270°C

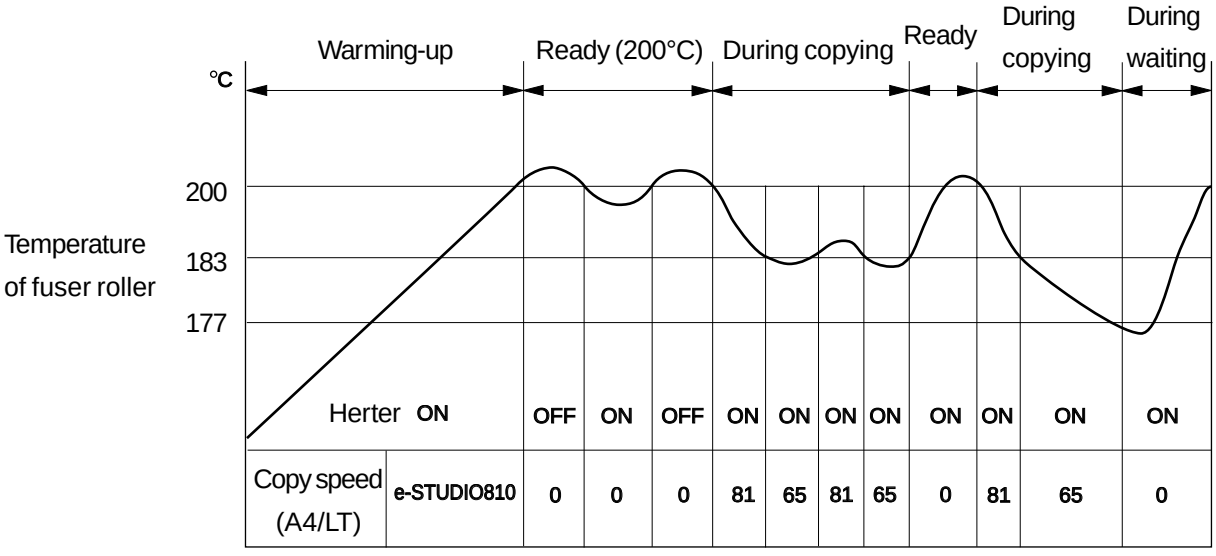
14. 4. 5. Temperature detecting section

To keep the fuser roller at a certain temperature, the center thermistor and side thermistor (rear) detect the temperature of the fuser roller and control ON/OFF of the IH coil. Outputs from the thermistors are used to detect abnormalities of the fuser roller temperature.

(1) Relation between the thermistor output voltage and surface temperature of the fuser roller:
Approx. 4.0V when the temperature is 200°C
Approx. 3.8V when the temperature is 183°C, and approx. 3.7V when the temperature is 177°C.

(2) Temperature control for the surface of the fuser roller:

Temperature	Fusing control
200°C and above	IH coil turned OFF
183~200°C	IH coil turned ON → Normal copy speed
177~183°C	Copying continued but the copy speed lowered (e-STUDIO810 only)
Below 177°C	Copying interrupted and back to the ready



(3) Temperature control for both ends of the fuser roller
During the multiple copying, the temperature of both ends of the fuser roller (where a paper does not pass on) generally becomes higher than that of the other areas (where a paper does pass on). The side thermistor (front) detects the temperature of the ends, in this case, it controls the center IH coil and side IH coil to unify the fuser roller temperature.

(4) Error detection during warming up (1)
If the output voltage of either the center thermistor or side thermistor (rear) does not go over approx. 0.5V(40°C) even in a certain period of time after the heater has turned ON, the “Call for service” [C41] is displayed.

(5) Error detection during warming up (2)

① If the output voltage of either the center thermistor or side thermistor (rear) does not go over approx. 1.9V(100°C) even in a certain period of time after it has exceeded 40°C or ② if it does not go over approx. 3.2V(150°C) even in a certain period of time after it has exceeded 100°C, the "Call for service" [C44] is displayed

(6) Error detection during warming up (3)

If the output voltage of the thermistor does not go over approx. 4.0V(200°C) even in a certain period of time after it has exceeded 150°C, the "Call for service" [C44] is displayed.

(7) Abnormality detection during standby/copying

If the output voltage of either the center thermistor or side thermistor (rear) becames 0.5V or lower for more than 0.5 sec., the "Call for service" [C43] is displayed, and if that of the side thermistor (front) becomes 0.5V or lower for more than 0.5 sec., the "Call for service" [C45] is displayed.

(8) Fuser roller thermistor error status counter

- To enhance the safety of the fuser unit, CPU provides the following protection: When the third [C41] error has occurred after two consecutive [C41] errors, even if an operator turns OFF the power and back ON, the IH coil is not turned ON and error [C41] is displayed immediately.
  However, if the copier becomes ready successfully with the fuser roller thermistor error status counter "1" or below, the counter is cleared to "0".

Note: If the heater is not turned ON and either of the error code [C41] to [C45] is still displayed even thougth the thermistor, thermostat and IH coil have been repaired and the power is turned ON, check the code "400" in the mode (08) to set the thermistor/heater status counter to "0".

Reference

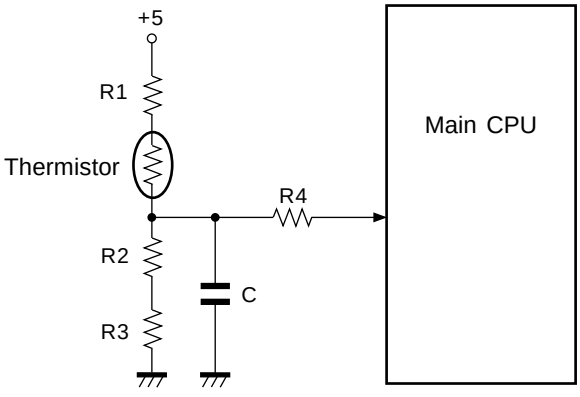
* The fuser roller thermistor error status counter does never have values other than 0 ~ 19 entered.

- If the fuser lamp does not turn ON and the "Call for service" [C41] is displayed immediately after the power is turned ON, check the fuser roller thermistor error status counter. If it is "2" or over, be sure to check the thermistor, thermostat and IH coil. Reset the counter to "0" (code "400" in the (08) mode) after repairing them, then turn ON the power.
- If the fuser roller thermistor error status counter is "20" or over (e.g., 21), there is a possibility that data in BCRAM or BCRAM itself may have been ruined due to causes such as leakage from the chargers. Check the bias, high-voltage transformers and charge wires to see if any of them is defective, and also look through all the data in the BCRAM.

14. 4. 6. Detection of open-circuited thermistors

A thermistor is a device which resistance decreases when it detects a high temperature. If the fuser roller thermistor is open-circuited, the control circuit finds that the fuser roller temperature is extremely low and keeps turning ON the IH coil. As a result, the fuser roller temperature rises, possibly activating the thermostat, which is a safety protection device. To prevent this, CPU works to detect if the thermistor is open-circuited or not.

* The following is a circuit diagram of the thermistor open-circuit detection circuit common with the center and side thermistors.



· The input voltage is obtained by dividing the resistor 1, thermistor, resistor 2 and resistor 3.

· The temperature of the fuser roller surface changes.

↓

The resistance of the thermistor changes.

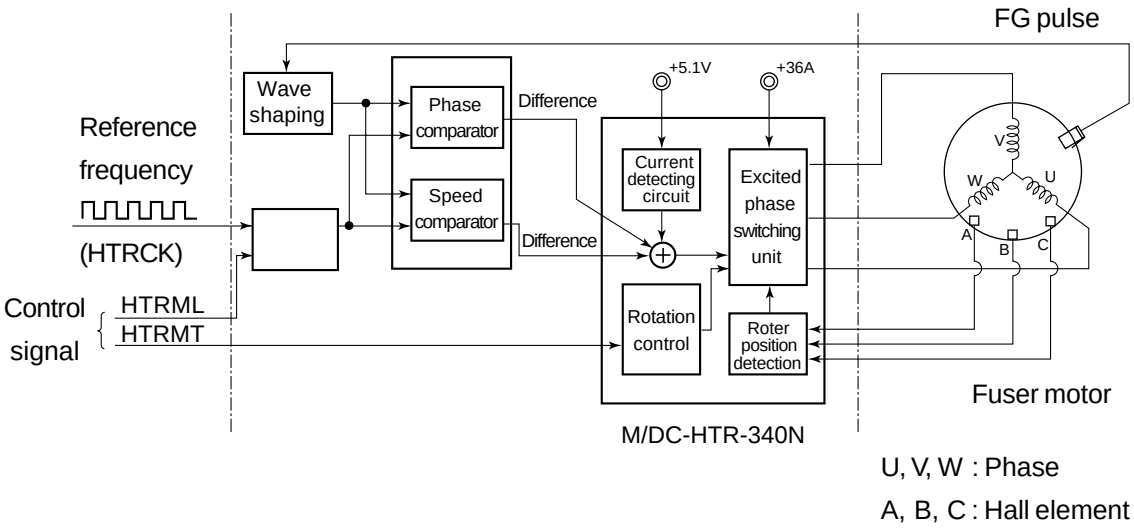
↓

The input voltage changes.

· The main CPU detects this change of the input voltage to decide if the thermistor is abnormal or not.

14. 5. Fuser Motor Drive

14. 5. 1. Outline of operation



(1) The LGC transmits control signals for the fuser motor rotation (HTRMT:Motor rotation command).

(2) The excited phase switching unit excites each phase on the fuser motor. ➛ Fuser motor rotates.

(3) Hall elements A to C are used to detect the rotation position of the motor (or rotor).

(4) The excited phase switching unit switches the excitation for each phase. (By repeating steps (2) through (4) above, the motor keeps rotating.)

(5) An FG pulse is generated by the rotation of the fuser motor.

(6) The phases and velocities of the FG pulse and the reference frequency from the LGC are compared, and the differences are added up. In addition to this are added the fluctuations in the supply voltage (Signal generation).

(7) The switching timing for the excited phase switching unit is changed to match the signal obtained in step (6). That is, control ensures that the FG pulse and reference frequency are equal. ➛ The fuser motor rotates at a constant speed (locked range state).

(8) When the HTRML signal changes to “H” level, the fuser motor stops rotating.

(9) During standby, the HTRML level changes to “L” if the temperature of the pressure roller drops below the reference temperature, and the fuser motor rotates at a low speed.

14. 5. 2. Control signals

(1) HTRCK signal (LGC → MOT:Input)
This signal is a reference clock signal for the fuser motor to rotate at a fixed speed.
The frequency of the reference clock is 1247.6Hz.

(2) HTRML signal (LGC → MOT:Input)
This signal switches low-speed fuser motor rotation ON/OFF. When the signal is “L”, the fuser motor rotates at a low speed.

(3) HTRMT signal (LGC → MOT:Input)
This signal is the fuser motor ON/OFF control signal. When the signal changes to “L”, the fuser motor is turned ON.

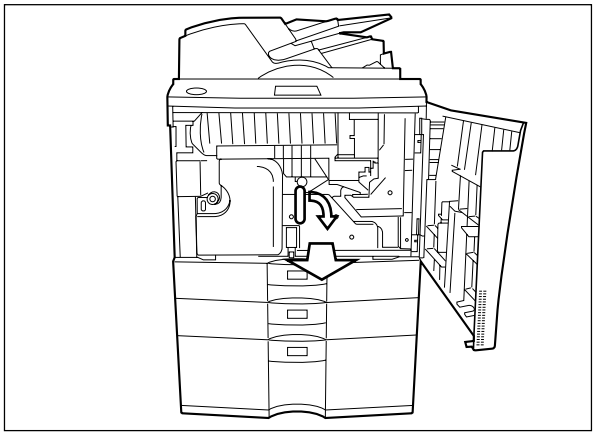
Signal level for motor circuit

Signal	“H” level	“L” level
HTRCK	Reference clock (1247.6Hz)	
HTRMT	Motor OFF	Motor low-speed ON
HTRML	Motor OFF	Motor ON

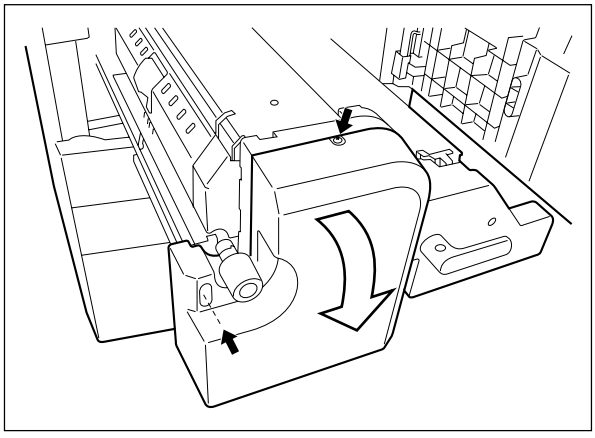
14. 6. Disassembly and Replacement

[A] IH control board

(1) Open the front cover, turn the handle clockwise and take off the transfer/transport unit.



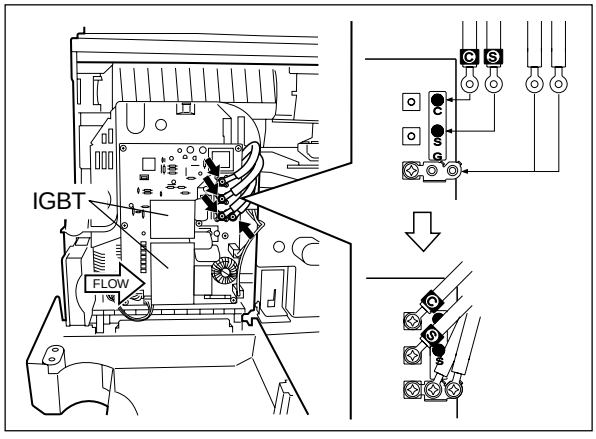
(2) Remove 2 screws and open the cover forward slowly.



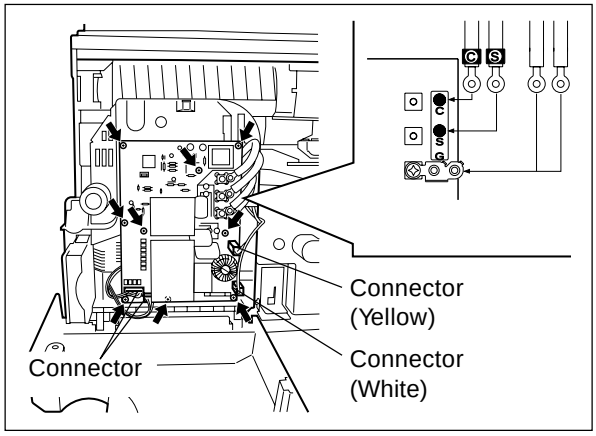
(3) Remove 4 screws and release the IH coil fuser harness.

Cautions:

1. When installing the IH coil fuser harness, be careful not to install it to a wrong place**.**
2. Tighten 4 screws of the IH coil fuser harness completely (tightening torque: 1.2~2.0Nm).
3. Since the IH control board is a high-voltage section, make sure to pull out the power cable at maintetance and checkup, especially, be careful not to touch the IGBT in turning on electricity at which it becomes high-voltage.

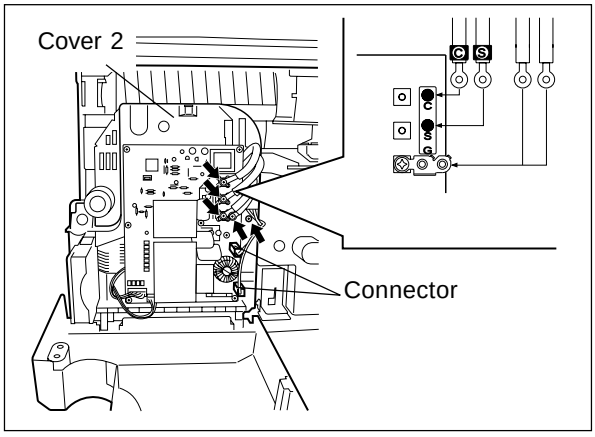


(4) Disconnect 4 connectors, remove 9 screws, and take off the IH control board.

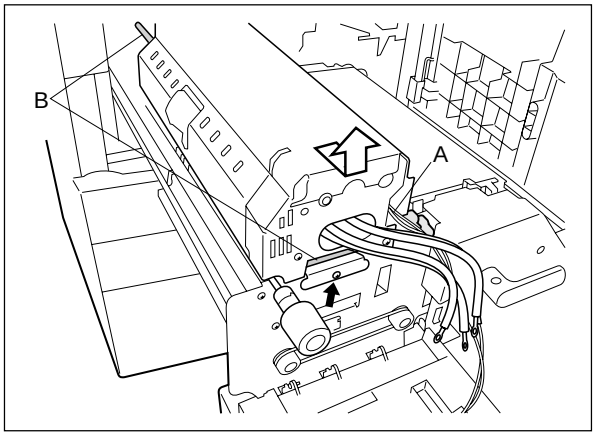


[B] Fuser unit

(1) Remove 2 screws and open the cover forward slowly.
(2) Remove 4 screws and release the IH coil fuser harness. Disconnect 2 connectors.
(3) Remove 1 screw and open the cover 2 forward.



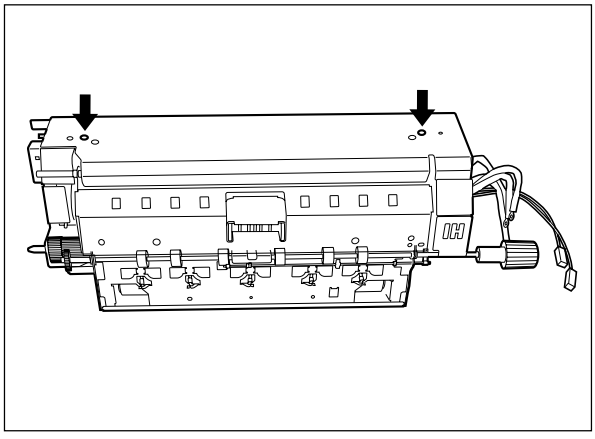
(4) Remove 1 screw move the fuser unit forward and lift it off upward.



Notes: 1. Make sure that the harness (A) at the right figure does not touch the bearing and shaft of the transfert/transport unit when installing the fuser unit.
2. Remove the fuser unit after fully lowering the temperature or wear gloves and such when removing it at a high temperature.
3. Hold B sections of the fuser unit when installing/removing it.

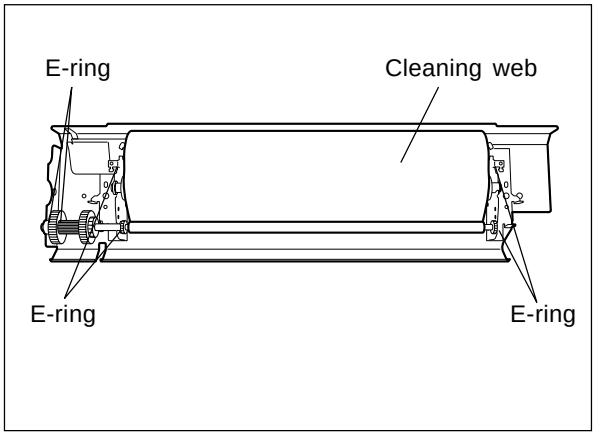
[C] Cleaning web unit

(1) Remove 2 black screws and take off the cleaning web unit.

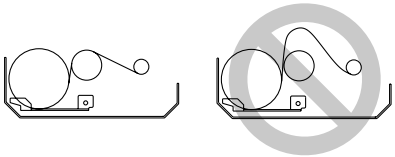


Note: The cleaning web unit can be taken off without removing the fuser unit.

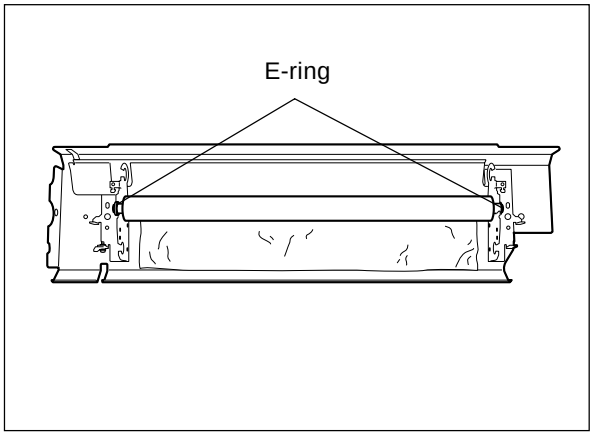
(2) Remove 4 E-rings and take off the cleaning web.
(3) Remove 2 E-rings and take off the bushing and gear.



Caution: Be carefull not to slack off the cleaning web when installing it.

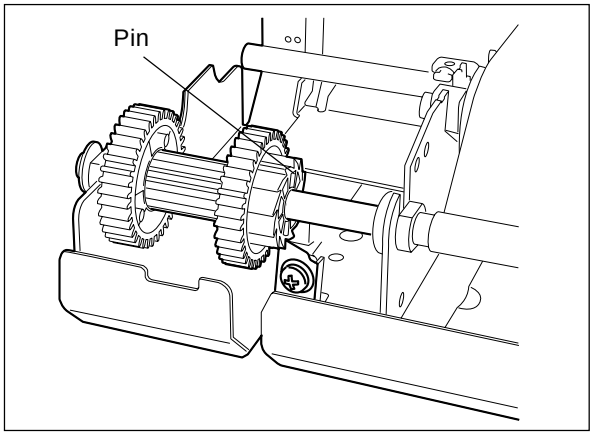


(4) Remove 2 E-rings and take off the web pushing roller.

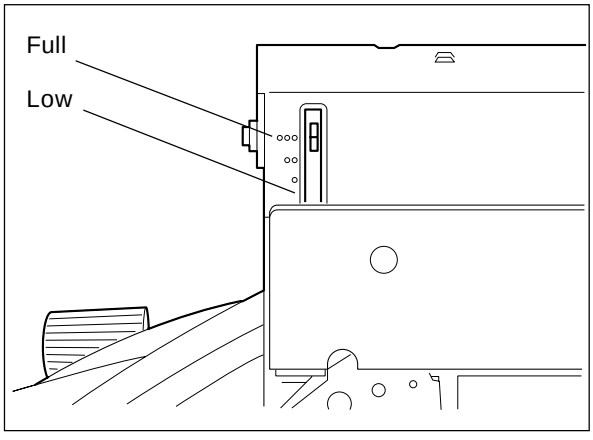


Cautions:

1. Take up the cleaning web a little (3~5 rotations with hand) after replacing the cleaning web and web pushing roller.
2. When installing the cleaning web unit to the fuser unit, make sure that the web is not slacked off.
3. Turn the fuser unit jam access knob 10~15 times to adapt the cleaning web to the fuser roller. At this time make sure that there is no defect caused by an installing inadequacy.
4. Make sure that the cleaning web is not riveled or slacked off.
5. Set up the PM support “6S” and clear the cleaning web counter. After clearing it, the web motor automatically rotates for 65 seconds when turning the power ON.
6. Turn the power ON and make sure that “READY” is displayed.
7. Finally confirm the fuser unit is in a proper condition (same as the above 6).
8. Do not rotate the web motor for more than 2 min. at the output check (03-124) since the cleaning web may be slacked off when rolled up.



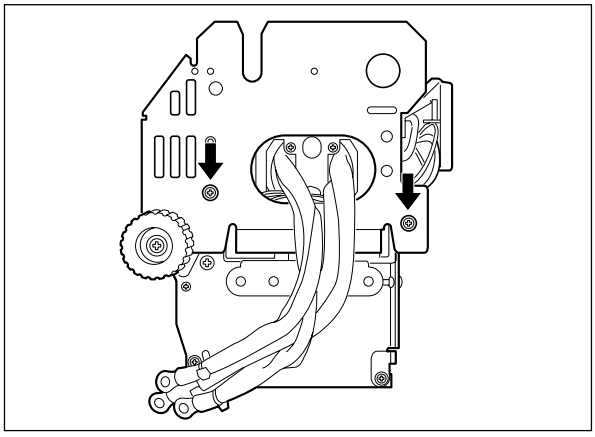
Note: Approximate remaining web can be seen through the window at the fuser unit (shown by the right figure).



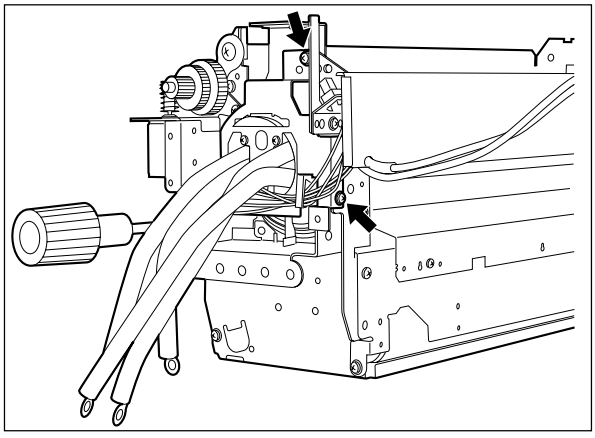
[D] IH coil

(1) Remove the cleaning web unit.

(2) Remove 2 screws and take off the fuser cover (front).

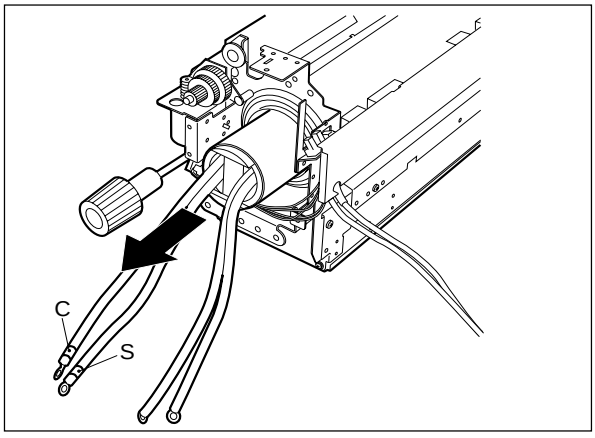


(3) Remove 2 screws and take off the bracket.



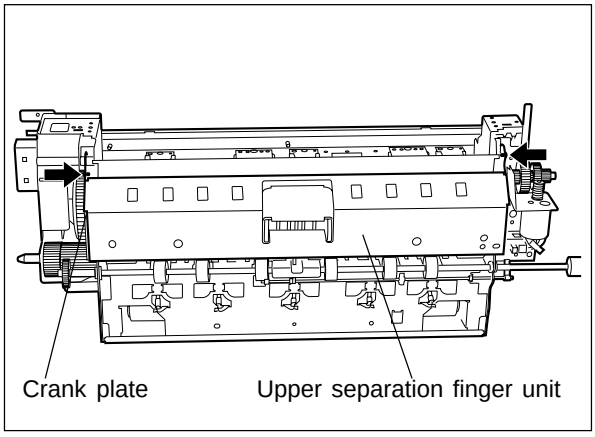
(4) Pull out the IH coil.

Note: Make sure that the “C” and “S” harnesses of the power supply harness comes to the left side when installing the IH coil.

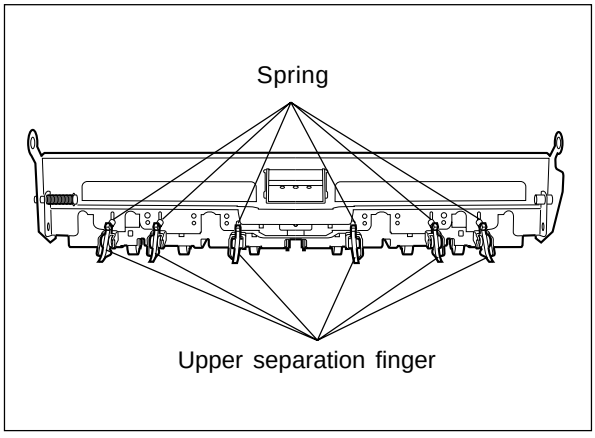


[E] Upper separation finger unit

(1) Remove 2 screws and take off the crank plate and upper separation finger unit.

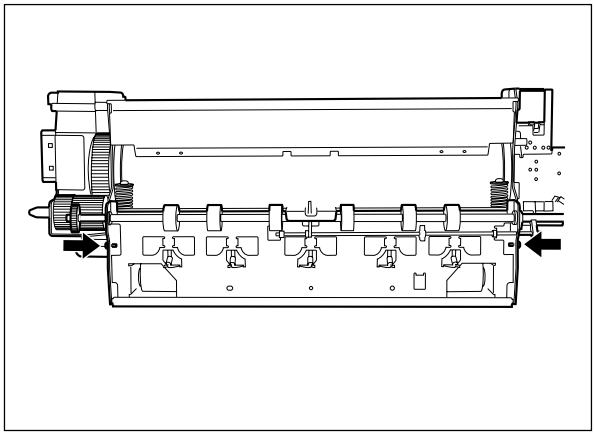


(2) Remove each spring and take off each separation finger.



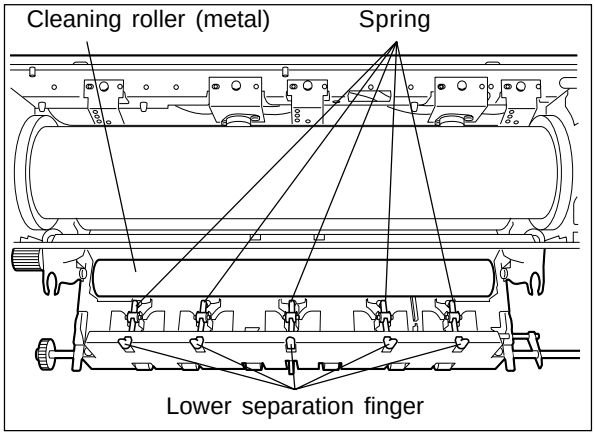
[F] Cleaning roller (metal)/Lower separation finger

(1) Remove 2 screws and open the guide.

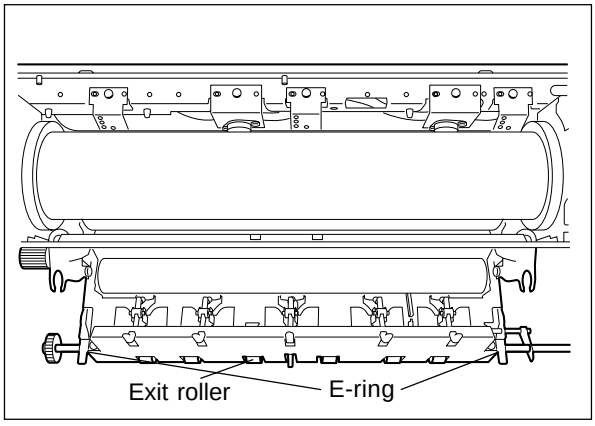


(2) Remove the cleaning roller (metal).

(3) Remove each spring and take off each lower separation finger.

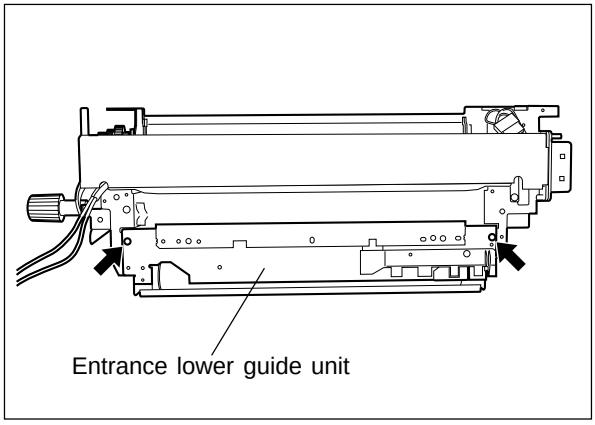


(4) Remove 2 E-rings and take off the exit roller.

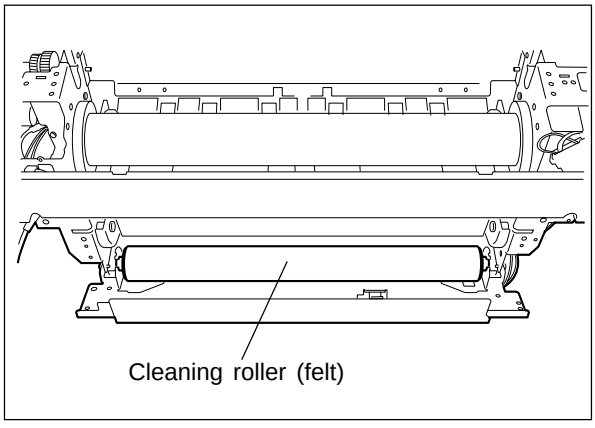


[G] Cleaning roller (felt)

(1) Remove 2 screws and open the entrance lower guide unit.

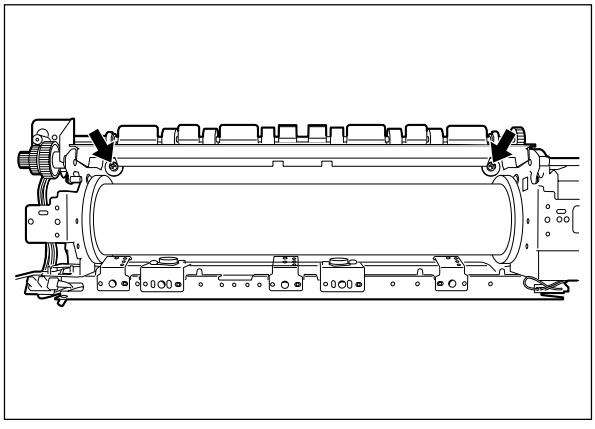


(2) Remove the cleaning roller (felt).

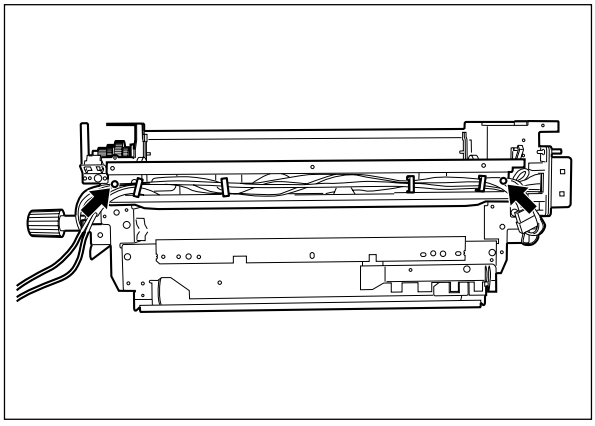


[H] Thermistor/Thermostat

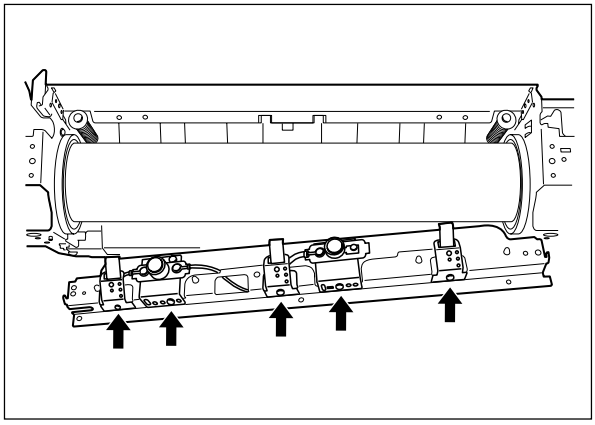
(1) Loosen 2 pressure screws completely.



(2) Remove 2 screws and take off the stay.

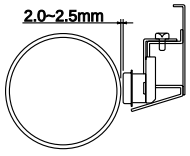


(3) Disconnect each connector, remove each screw and take off the thermistor and thermostat.



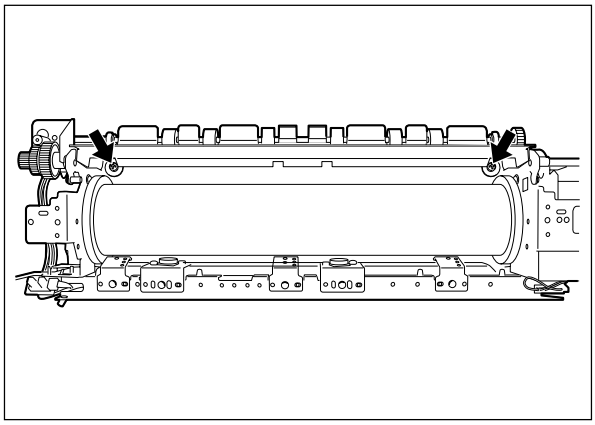
Notes: 1. When instaling the thermister and thermostat, be careful not to deform them and plate to which they are installed.

2. Adjust the gap between the thermostat (2 points) and fuser roller to the range between 2~2.5mm.

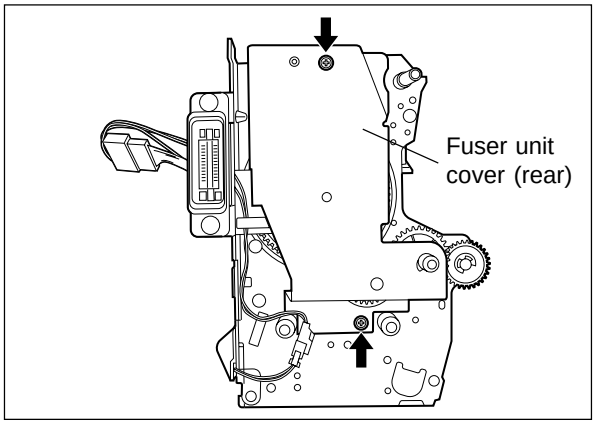


[I] Fuser roller

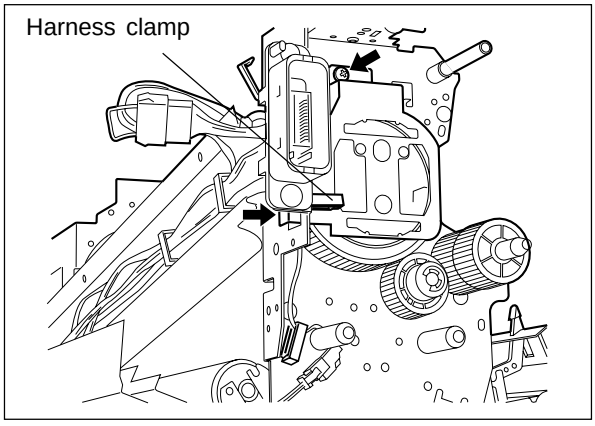
(1) Loosen 2 pressure screws completely.



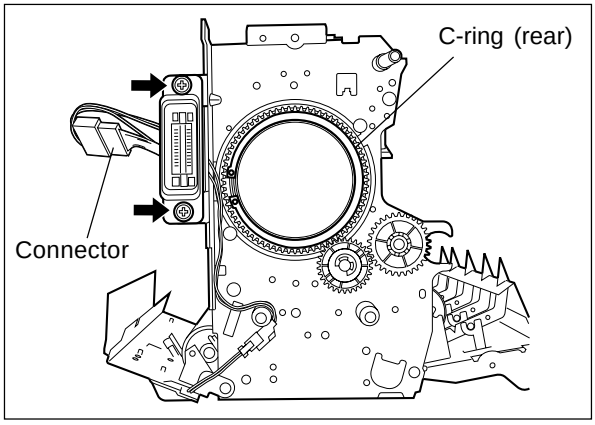
(2) Remove 2 screws and take off the fuser unit cover (rear).



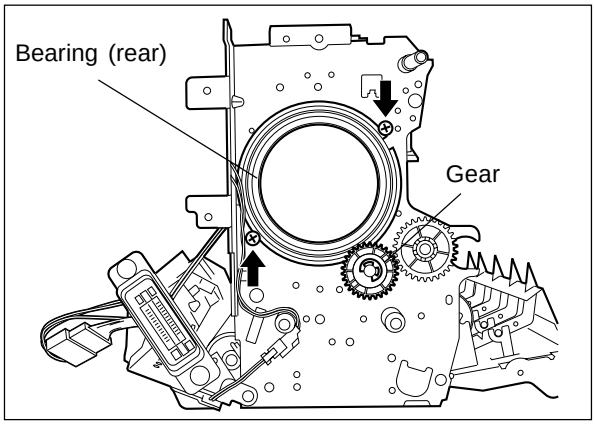
(3) Remove 2 screws, release 2 harness clamp and take off the bracket with releasing the catching section.



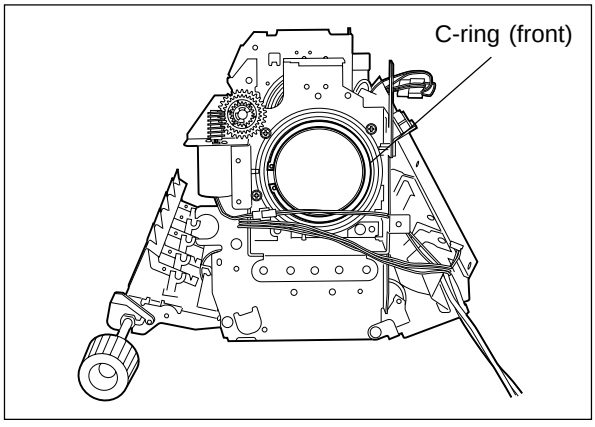
(4) Remove 2 screws and disconnect 1 connector.
(5) Remove 1 C-ring (rear).



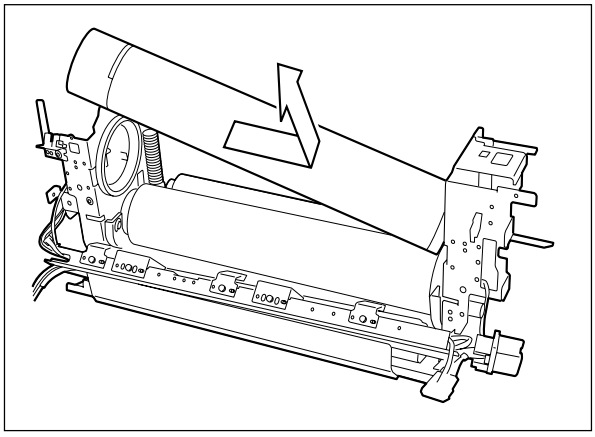
(6) Remove 1 E-ring and take off the gear.
(7) Remove 2 screws and take off the bearing (rear).



(8) Remove 1 C-ring (front).

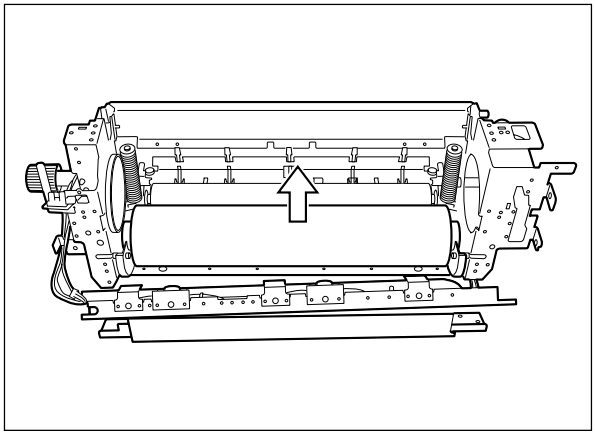


(9) Take off the fuser roller covering it with paper and such not to make scars on it.



[J] Pressure roller

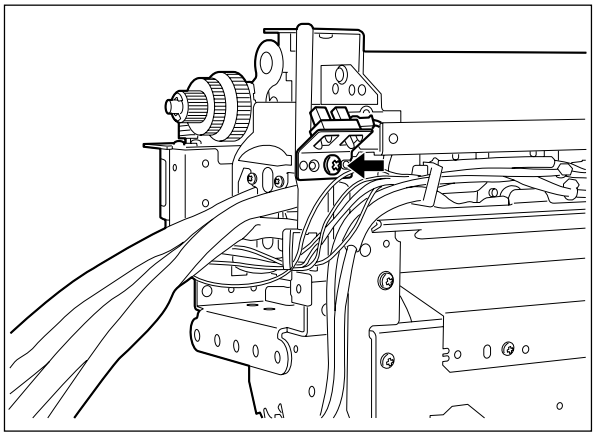
(1) Remove the fuser roller and take off pressure roller.



[K] Web detection sensor

(1) Remove the fuser unit cover (front).

(2) Remove 1 screw and take off the web detection sensor with the bracket.



15. EXIT/REVERSE SECTION

15. 1. General Description

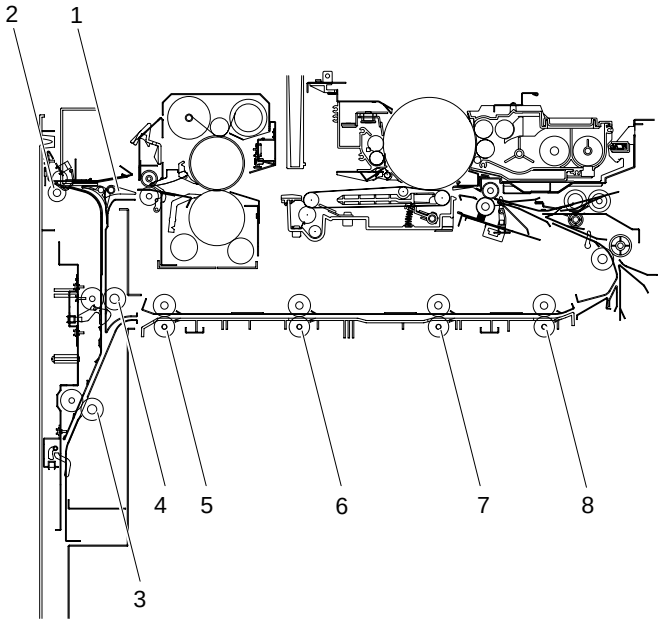
15. 2. Operation

15. 3. Disassembly and Replacement

15. EXIT/REVERSE SECTION

15. 1. General Description

This copier conducts a paper reverse operation when printing more than 2 sheet of paper or carrying out a duplex printing. Its reversing device once transports the paper from the fuser unit to the reverse path where the paper is switched back and reversed, and then transports it to the exit roller or transfer section.



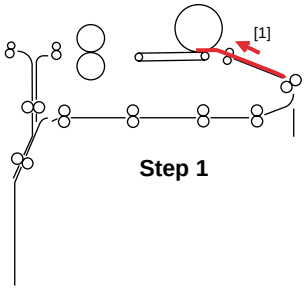
[sectional view]

No.	Name
1	Exit/Reverse gate
2	Exit roller
3	Reverse path roller 2
4	Reverse path roller 1
5	Horizontal transport roller 1
6	Horizontal transport roller 2
7	Horizontal transport roller 3
8	Horizontal transport roller 4

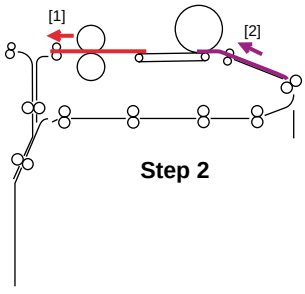
15. 2. Operation

The paper from the fuser unit is transported to the reverse path by the gate, which is usually directed toward the reverse path and switched by the solenoid only when the reverse operation is not carried out. When the trailing edge of the paper has passed through the exit sensor at the fuser unit, the paper transport speed at the transport path is switched to a high one and switched back in a specified time after that. The paper is transported to the exit roller with keeping the high speed and discharged to the outside of the copier. When carrying out a duplex printing, the paper switched back at the reverse path is transported to the horizontal transport section, which is under the transfer/transport unit and switches the paper transport speed to a normal one at this time, and it is again transported to the transfer section and fused there. Then, after the duplex paper has passed through the fuser unit and the gate has been switched, it is discharged to the outside of the copier by the exit roller without being transported to the reverse path.

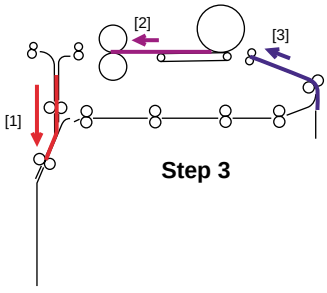
(a) 3 sheets × 1 copy Single-sided printing operation (A4/LT)



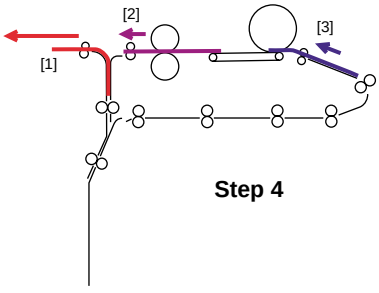
Step 1



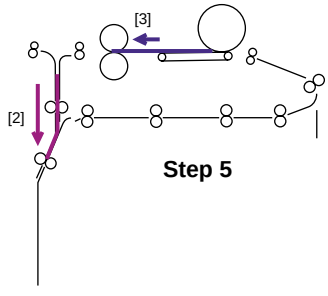
Step 2



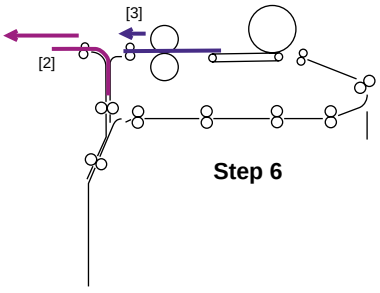
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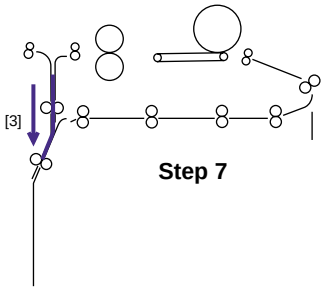
Step 4



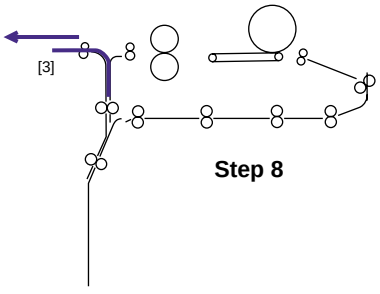
Step 5



Step 6

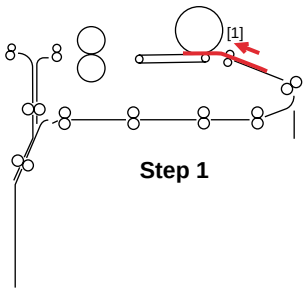


Step 7

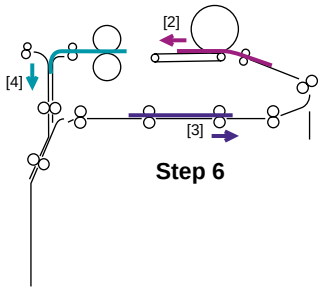


Step 8

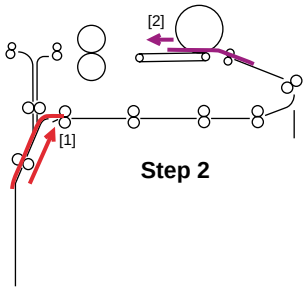
(b) 5 sheets × 1 copy Duplex printing operation (A4/LT)



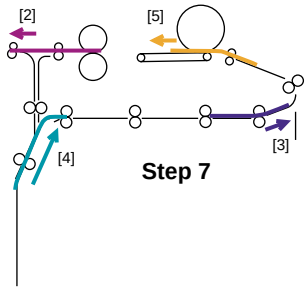
Step 1



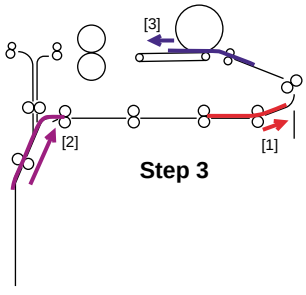
Step 6



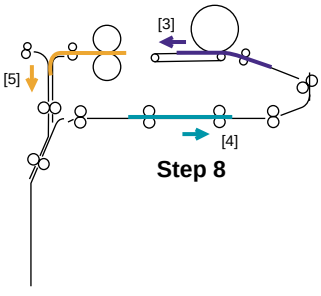
Step 2



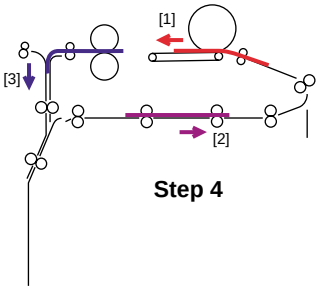
Step 7



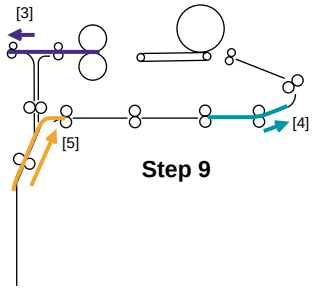
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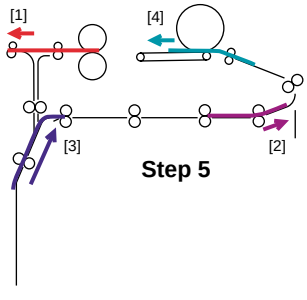
Step 8



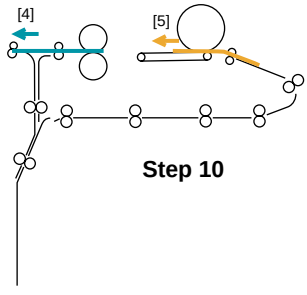
Step 4



Step 9

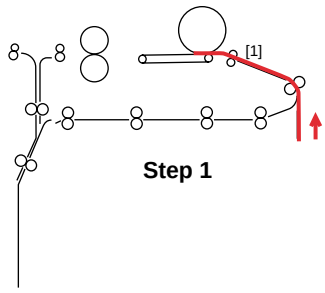


Step 5

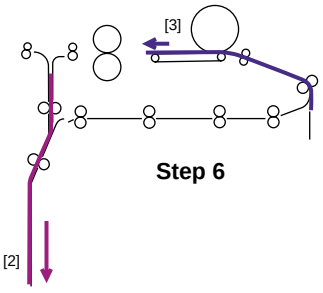


Step 10

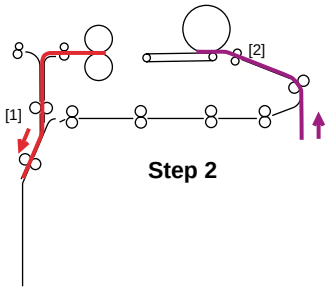
(c) 3 sheets × 1 copy Single-sided printing operation (A3/LD/B4/LG/A4-R/LT-R)



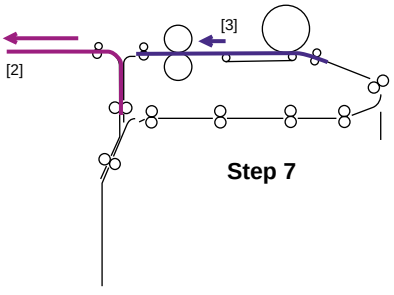
Step 1



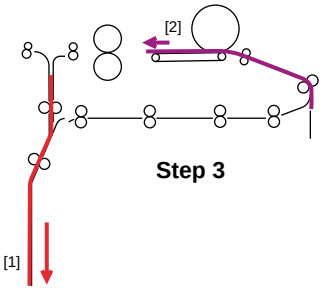
Step 6



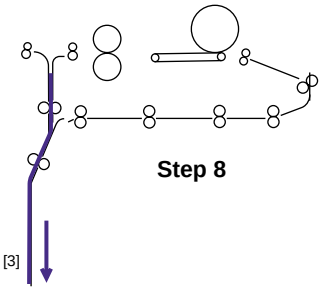
Step 2



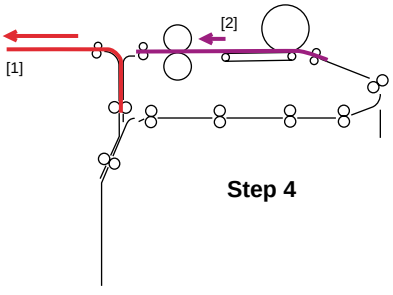
Step 7



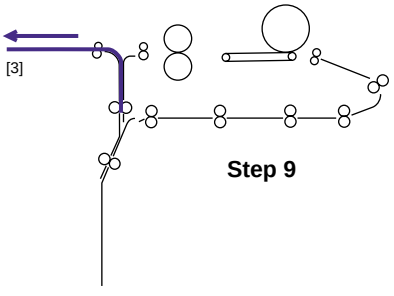
Step 3



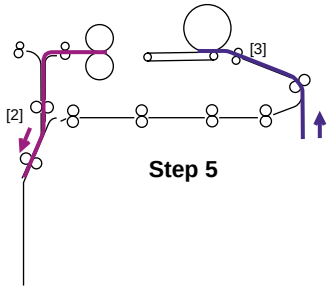
Step 8



Step 4

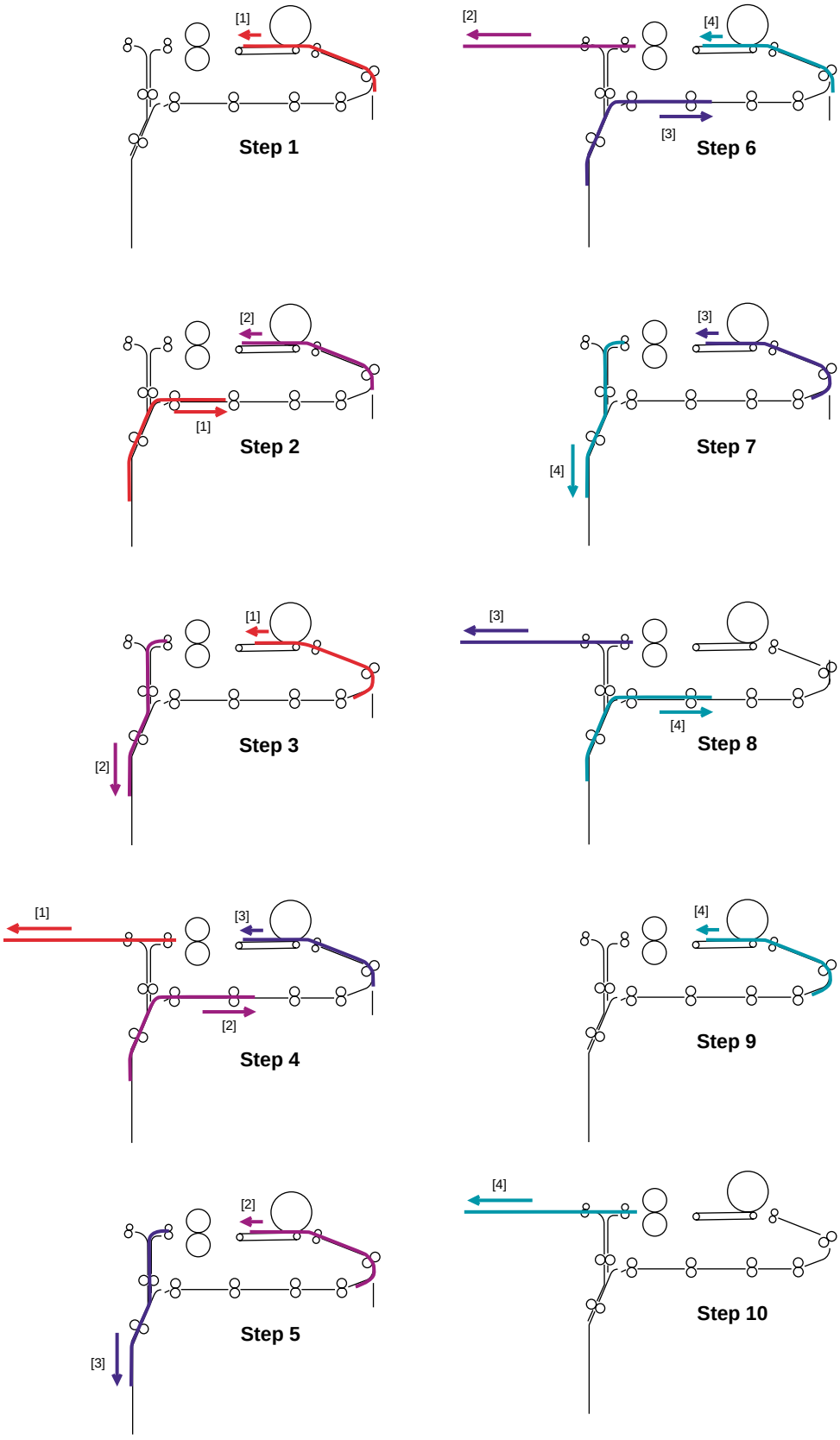


Step 9



Step 5

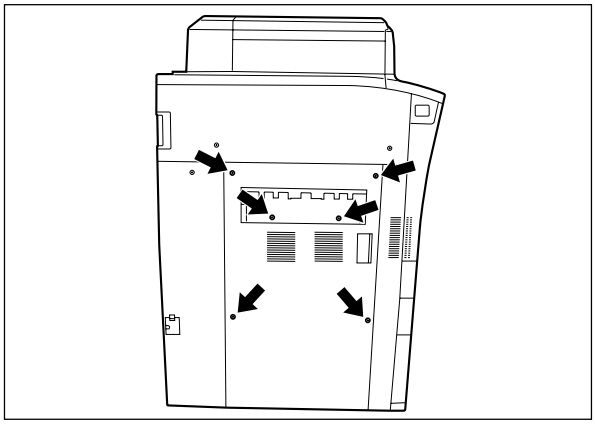
(d) 4 sheets × 1 copy Duplex printing operation (A3/LD/B4/LG/A4-R/LT-R)



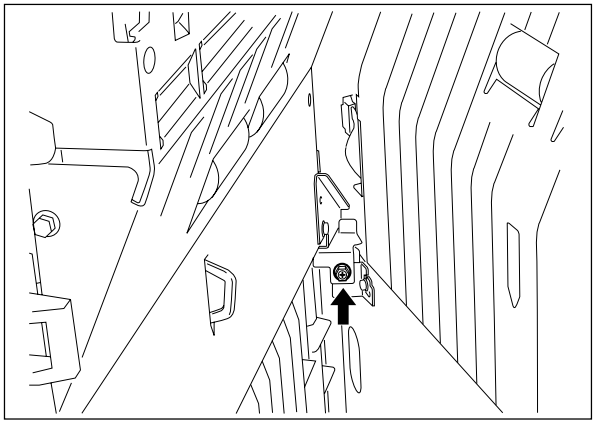
15. 3. Disassembly and Replacement

[A] Exit/Reverse unit

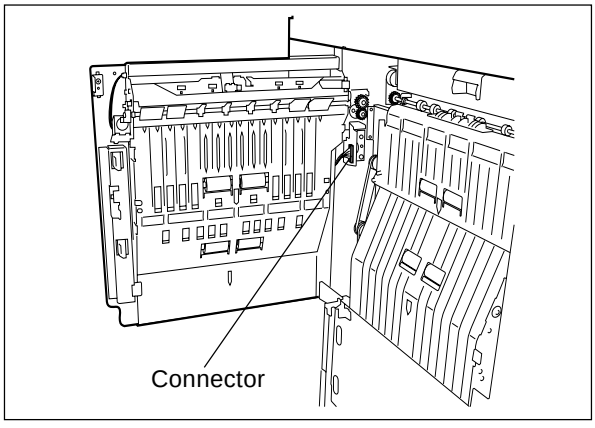
(1) Remove 6 screws and take off the exit side cover.



(2) Remove 1 screw and take off the fixing bracket.



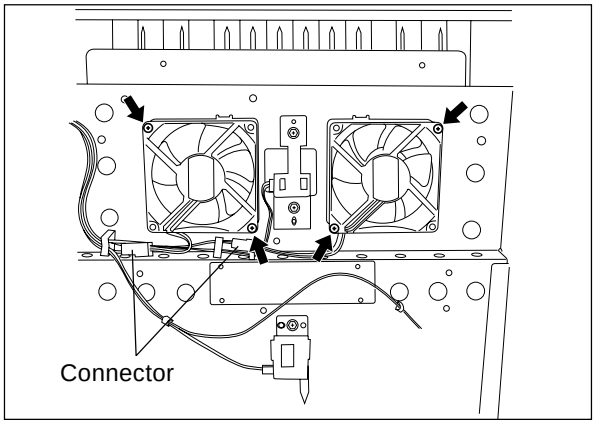
(3) Disconnect 1 connector and lift the exit/reverse unit to take it off.



[B] Reverse section fan

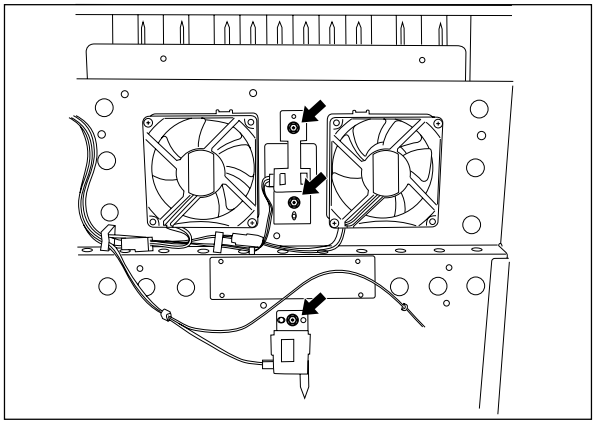
(1) Remove the exit side cover.

(2) Disconnect 1 connector, remove 2 screws and take off the fans.



[C] Sensor

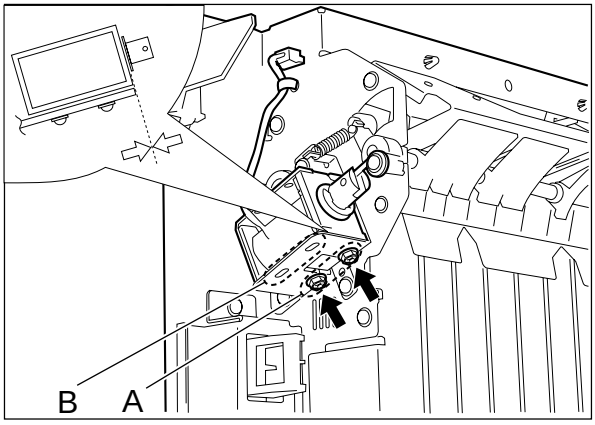
(1) Disconnect 1 connector, remove 2 screws (1 for the lower sensor) and take off the sensors.



[D] Gate solenoid

(1) Disconnect 1 connector, remove 2 screws and take off the solenoid.

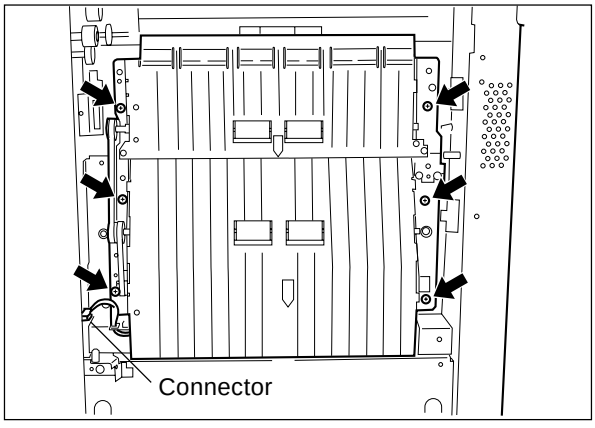
Note: When installing the solenoid, put together both edges of the plate and solenoid.
While the solenoid is ordinarily screwed up at the A position, it can be slided if screwed up at the B position.



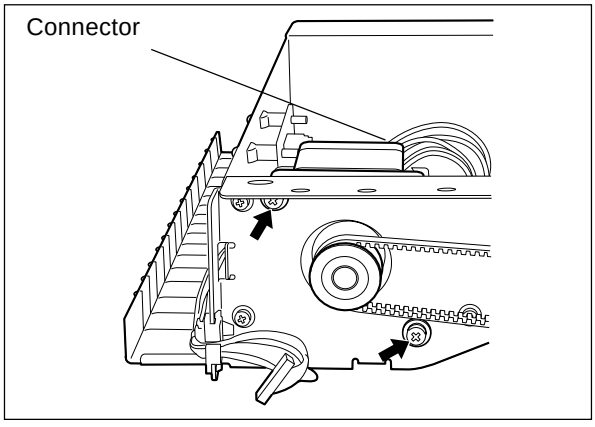
[E] Reverse motor

(1) Remove the reverse section drive unit.

(2) Disconnect 1 connector, remove 6 screws and take off the transport guide.



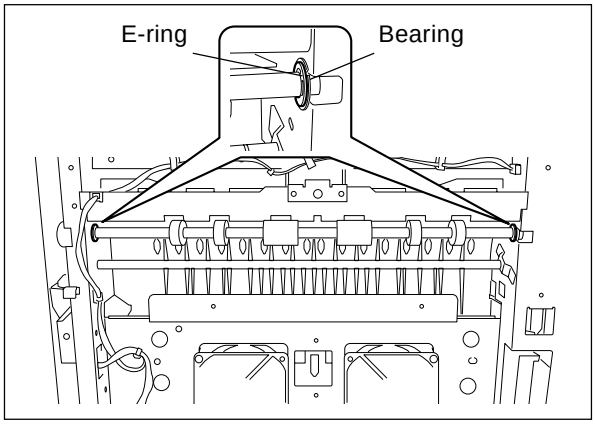
(3) Disconnect 1 connector, remove 2 screws and take off the reverse motor.



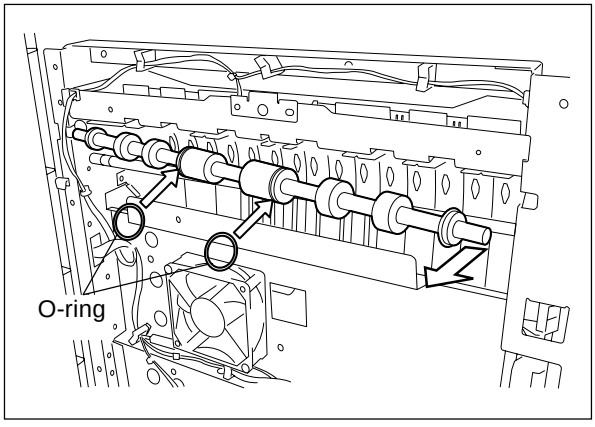
[F] O-ring

When installing the receiving tray, add the O-rings (service parts) to the exit roller in order to improve the paper stacking condition.

(1) Remove 6 screws and take off the exit side cover.
(2) Remove 2 E-rings and move the 2 bearings toward the inside.



(3) Move the exit roller to the near side and install 2 O-rings to the grooves of the exit roller.



Note: O-ring: Refer to the parts list for the parts number and so on.

16. REVERSING AUTOMATIC DOCUMENT FEEDER (RADF)

16. 1. General Description
16. 2. Construction
16. 3. Drive System
16. 4. Signal Block Diagram
16. 5. Operations
  16. 5. 1. A4 single-sided feeding
    (Operational condition: A4 paper/Rreproduction ratio: 100%)
  16. 5. 2. A4 double-sided feeding
    (Operational condition: A4 paper/Reproduction ratio: 100%)
  16. 5. 3. A3 single-sided feeding
    (Operational condition: A3 paper/Reproduction ratio: 100%)
  16. 5. 4. A3 double-sided feeding
    (Operational condition: A3 paper/Reproduction ratio: 100%)
  16. 5. 5. Single-sided feeding at mixed-original mode
    (Operational condition: A4-R and FOLIO papers/Reproduction ratio: 100%)
16. 6. Jams
  16. 6. 1. Jams at feeding section
  16. 6. 2. Jams at transporting section
  16. 6. 3. Jams at large original exit section
  16. 6. 4. Jams at small original reverse section
  16. 6. 5. Jams at small original exit section
  16. 6. 6. Jams at intermediate transport section
16. 7. Erros
16. 8. Original Size Detection
  16. 8. 1. Original size detection method
  16. 8. 2. Original size detection chart
16. 9. Flow Chart
16.10. Timing Chart
16.11. Circuits
16.12. Input/Output Signals
16.13. Disassembly and Replacement

16. REVERSING AUTOMATIC DOCUMENT FEEDER (RADF)

16. 1. General Description

The Reversing Automatic Document Feeder (RADF) is a device that automatically feeds originals one by one to the ADF original glass and discharges them to the receiving tray after scanning is finished. RADF consists of the following sections.

• Original feeding section

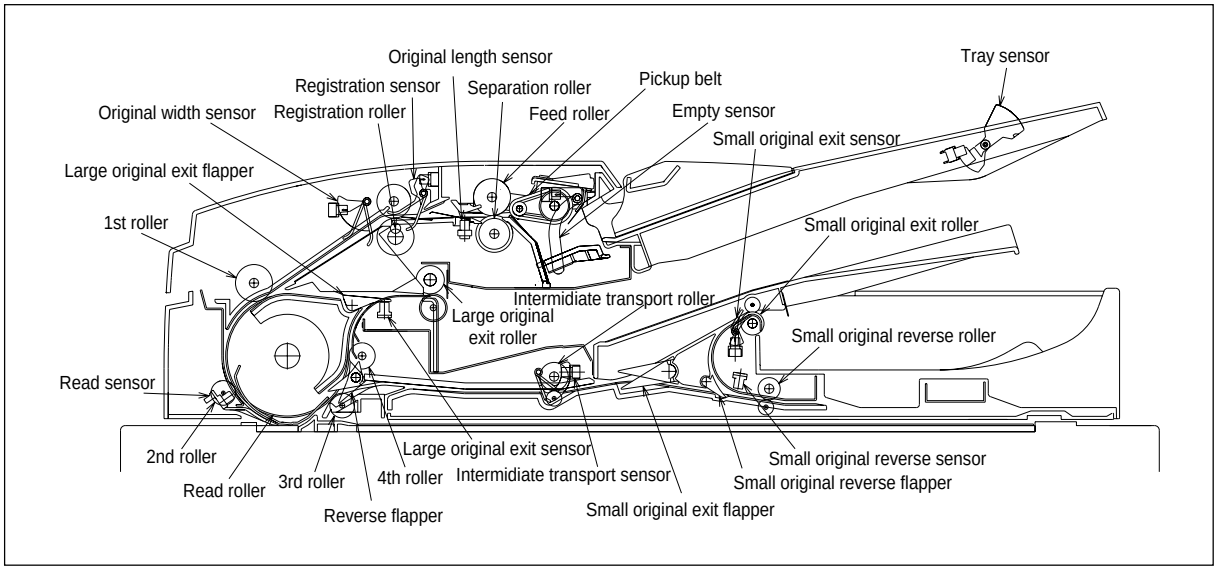
This section, cosisting of the pickup belt, feed roller, separation roller, registration roller, etc., feeds originals one by one to the ADF original glass.

• Original transporting/scanning section

This section, consisting of the read roller, transport roller, etc., transports an original on the ADF original glass and scans it at the same time.

• Original reverse/exit section

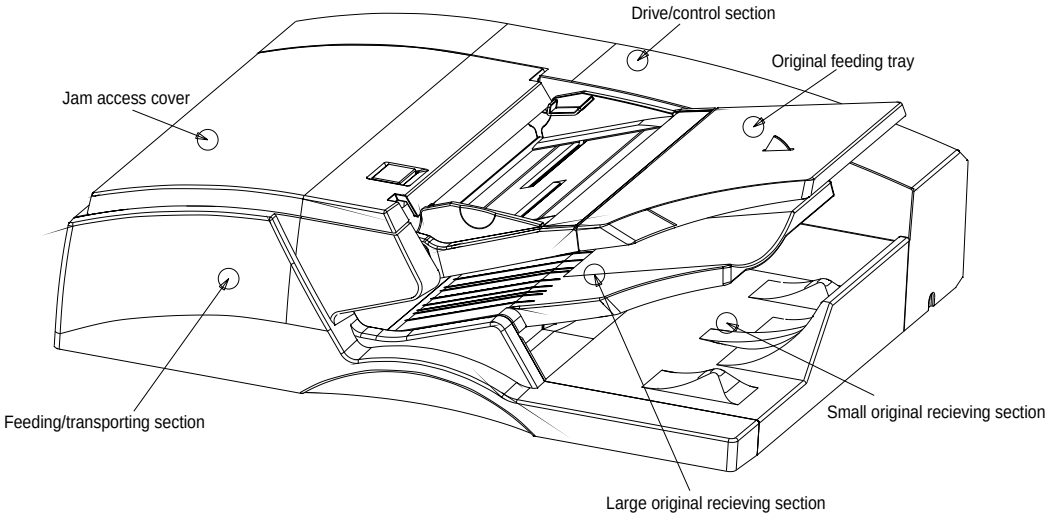
This section, consisting of the exit roller, reverse flapper, reverse roller, etc., discharges an original to either the large or small receiving tray after scanning is finished. When two-sided scanning is carried out, the original is reversed by switching the reverse flapper and fed again to the ADF original glass.



Note: Large-sized original: A3, B4, LD, LG

Small-sized original: A4, A4-R, B5, B5-R, A5-R, LT, LT-R, ST-R

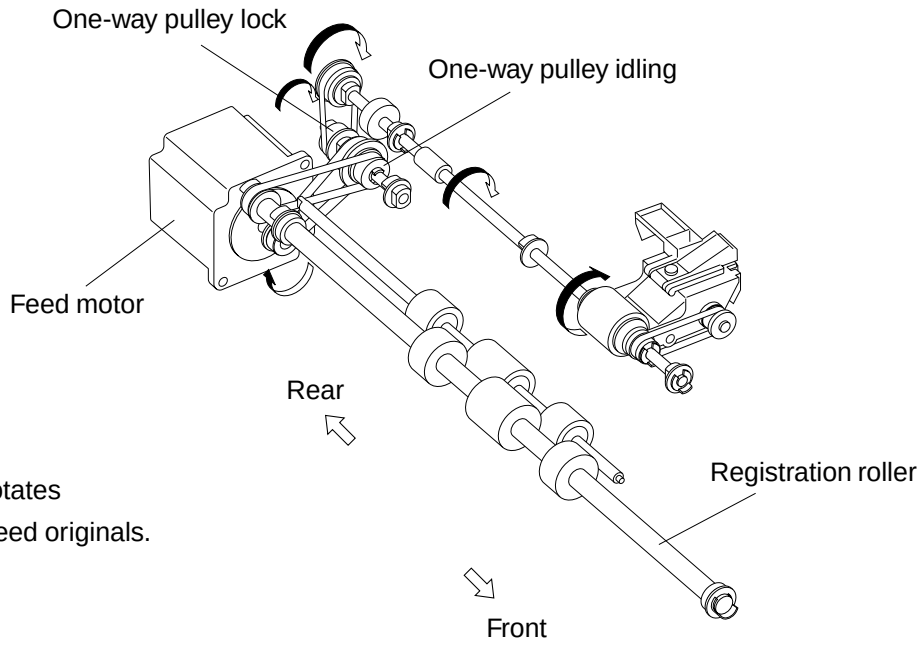
16. 2. Construction



	Apparatus	Electric parts
Feeding/transporting section	• Jam access cover • Pickup belt • Feed roller • Separation roller • Registration roller • Read roller • Exit/Reverse roller • Intermediate transport roller • Small original reverse roller • Small original exit roller	• Empty sensor • Upper limit sensor • Lower limit sensor • Cover open/close sensor • Original length sensor • Registration sensor • Original width sensor • Read sensor • Intermediate transport sensor • Large original exit sensor • Small original reverse sensor • Small original exit sensor
Original feeding tray	• Original feeding tray	• Tray sensor • Tray width sensor
Drive/control section		• Feed motor • Tray lift motor • Read motor • Large original exit motor • Disengagement solenoid • Large original exit solenoid • Small original exit solenoid • RADF open/close sensor • APS operation sensor • Cover open/close switch • RADF open/close switch

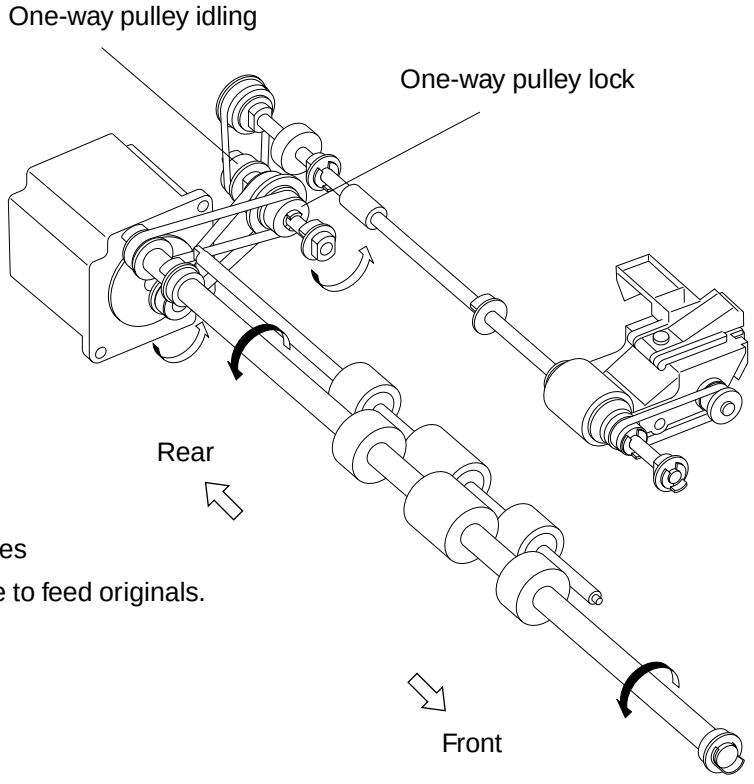
16. 3. Drive System

(1) Feed motor rotating forward (seen in front)



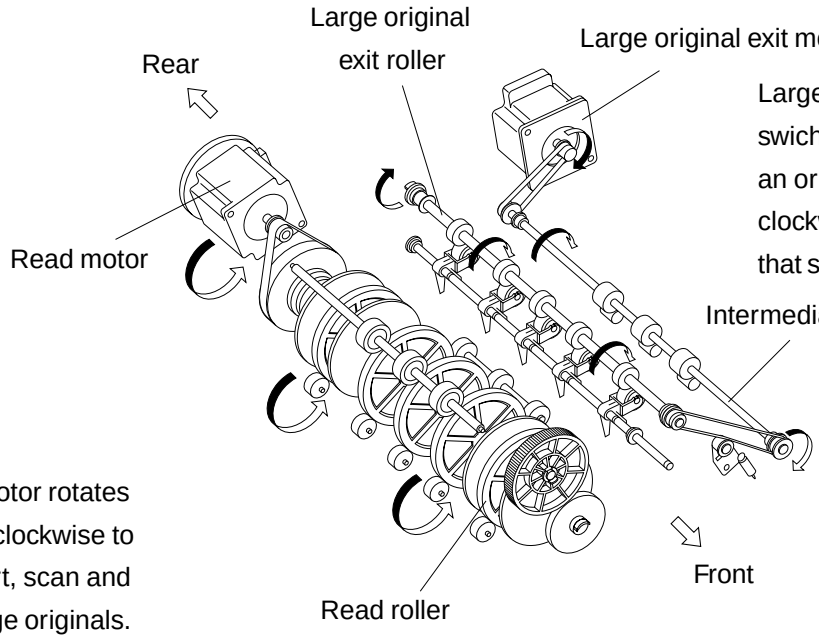
Feed motor rotates
clockwise to feed originals.

(2) Feed motor rotating in reverse (seen in front)

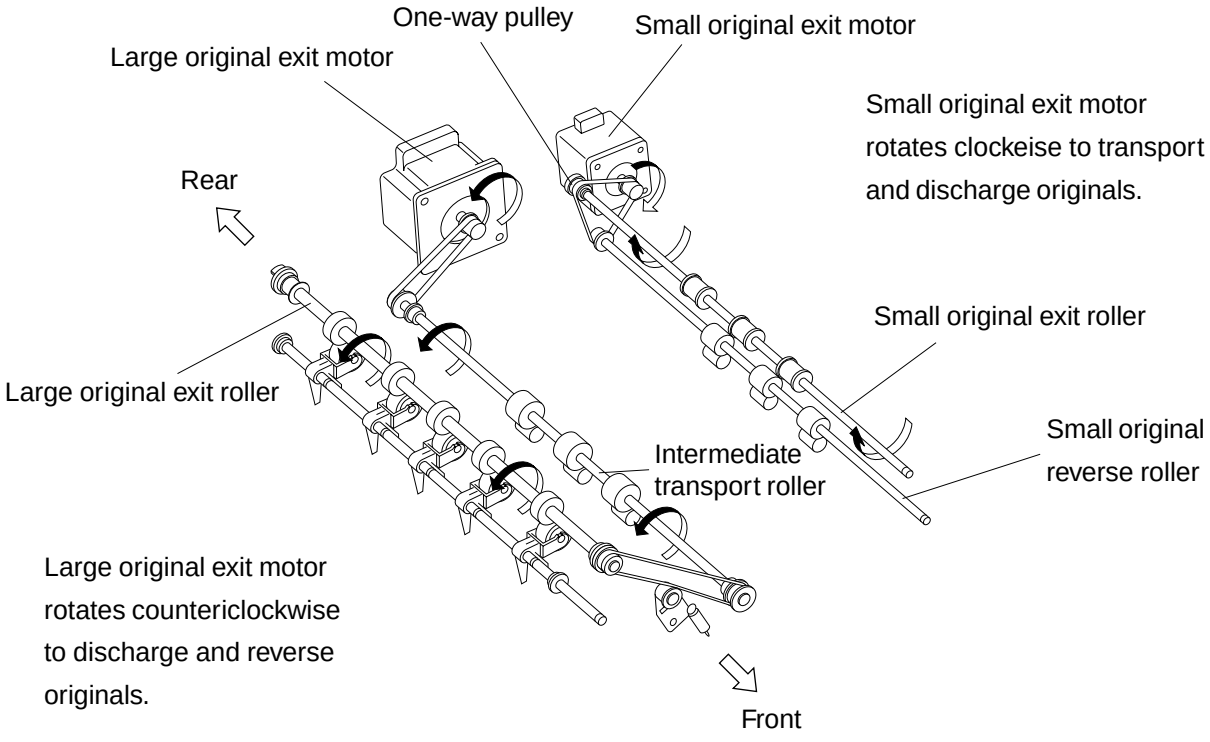


Feed motor rotates
counterclockwise to feed originals.

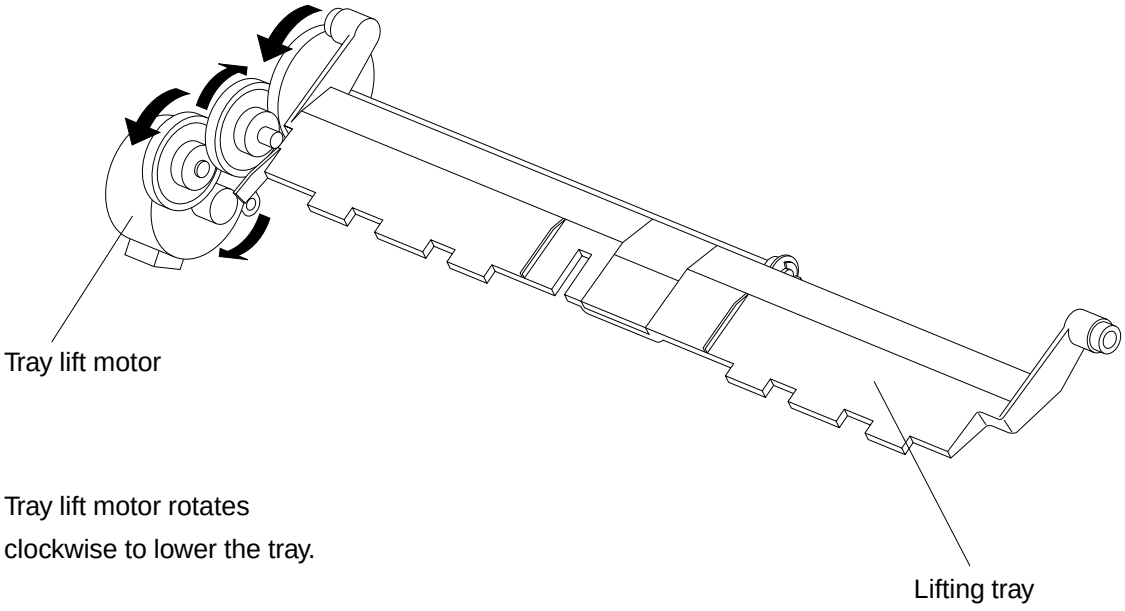
(3) Read motor rotating in reverse (seen in front)



(4) large original exit motor rotating in reverse (seen in front)

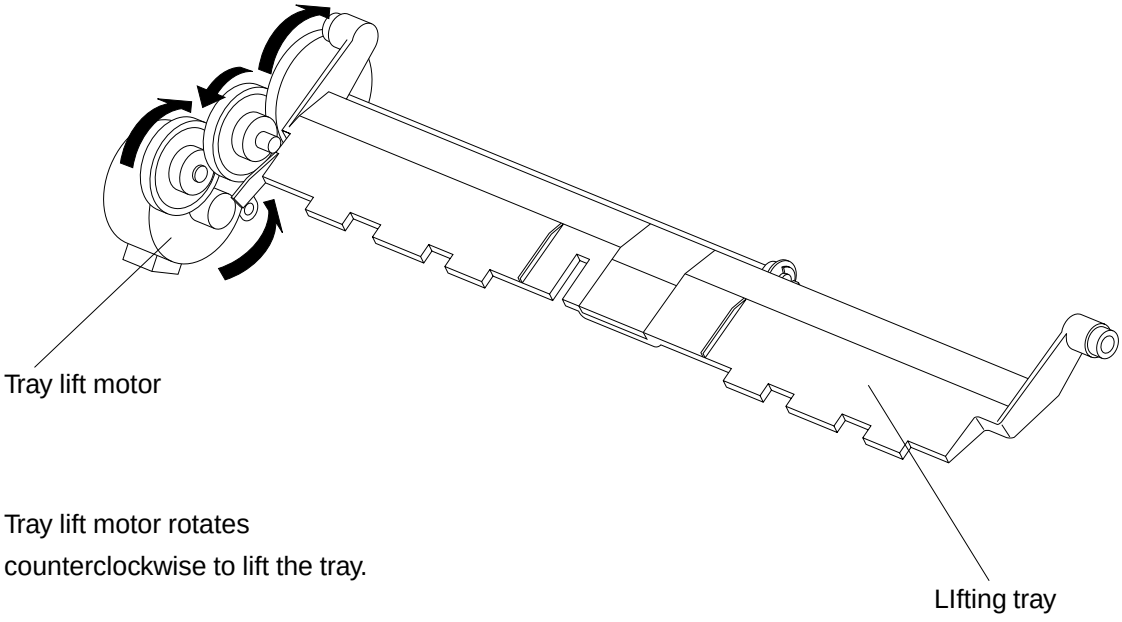


(5) Tray lift motor rotating forward (seen in front)



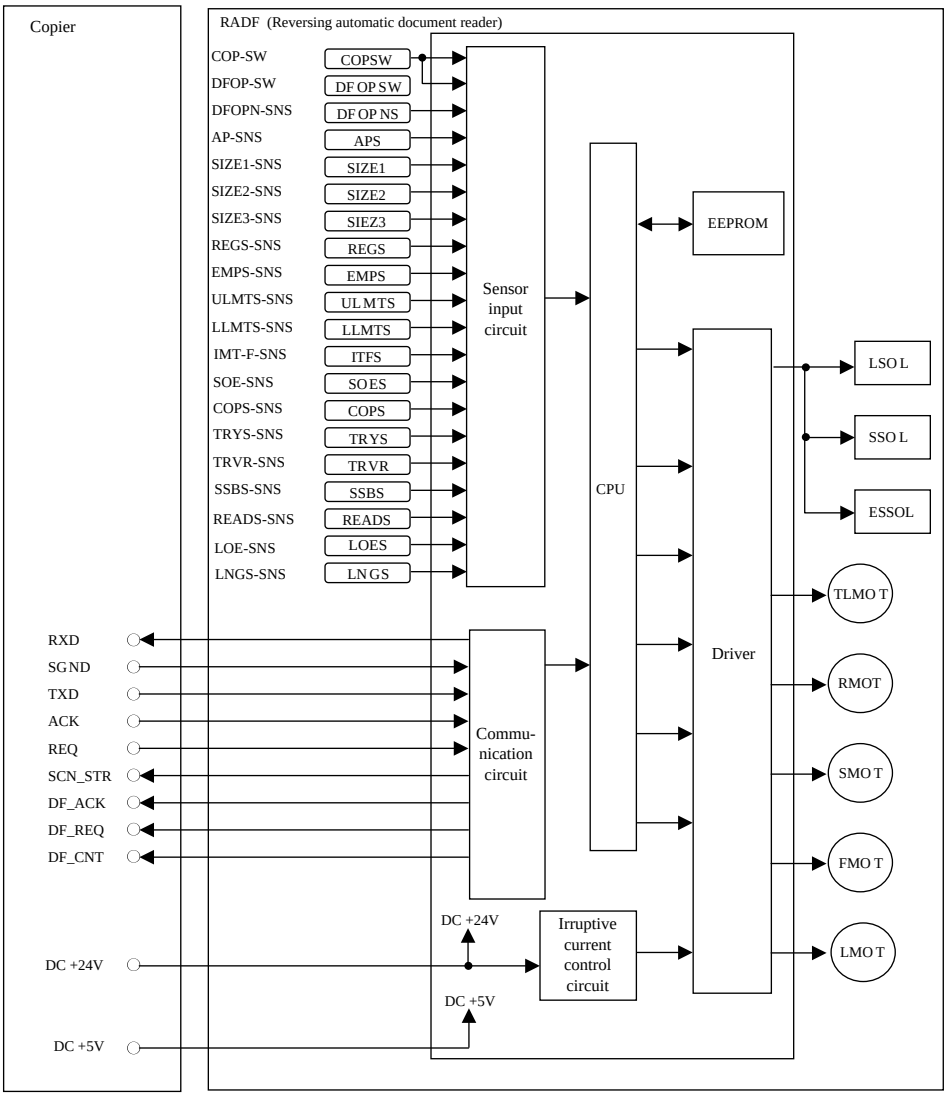
Tray lift motor rotates
clockwise to lower the tray.

(6) Tray lift motor rotating in reverse (seen in front)



Tray lift motor rotates
counterclockwise to lift the tray.

16. 4. Signal Block Diagram



The following 8 lines are used for sending/receiving of signals between the copier and RADF.

REQ ..... Communication request signal (copier to RADF)

DF-REQ ..... Communication request signal (RADF to copier)

DF-ACK ..... Response signal to communication request signal (RADF to copier)

ACK ..... Response signal to communication request signal (copier to RADF)

TxD ..... Data sent to RADF from copier

RxD ..... Data sent to copier from RADF

SCN_STR ..... Scanning start signal

DF_CNT ..... Detection signal of connection to DF

The data communication (RxD and TxD) between the copier and RADF is adopting a serial communication system which makes it impossible to check with a testing device whether signals are sent/received properly.

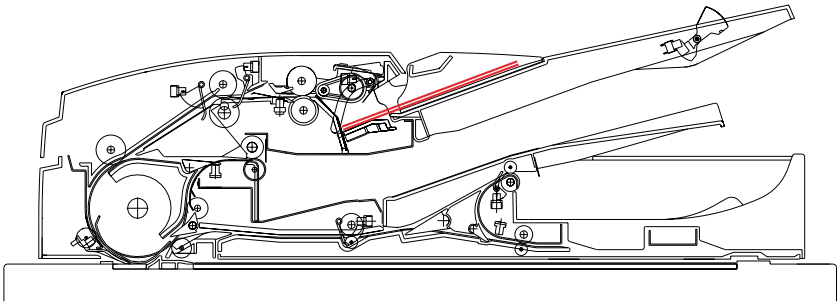
16. 5. Operations

16. 5. 1. A4 single-sided feeding

(Operational condition: A4 original/Reproduction ratio: 100%)

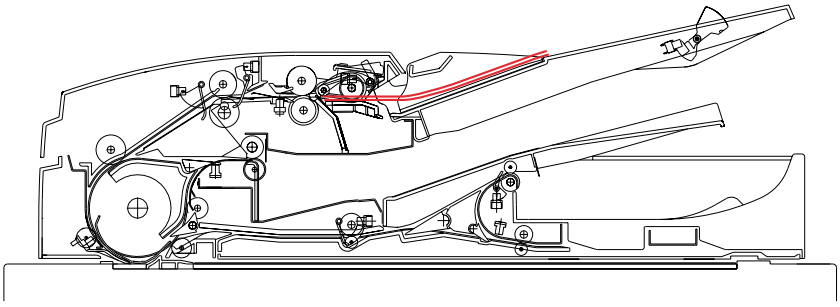
(1) Original setting

The empty sensor turns ON when the original has been set on the original feeding tray.



(2) Lifting of the lifting tray

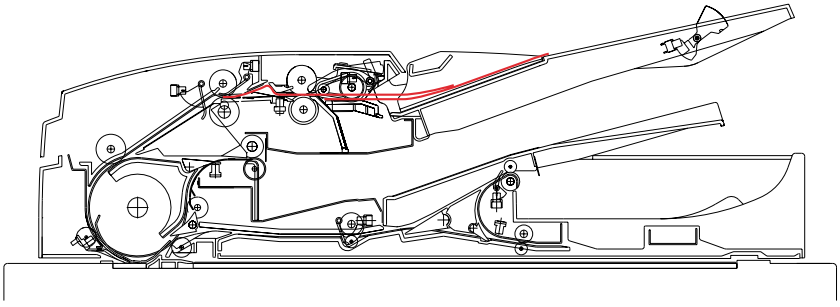
The tray lift motor rotates to lift the tray after receiving the original feeding signal from the copier. With a specified delay after the upper limit sensor has detected a top side of the original, the tray lift motor stops rotating.



(3) Start of separation

The feed motor starts to rotate forward. When the original length sensor detects the leading edge of the original, the tray lift motor starts to rotate to lower the tray to a specified level.

The feed motor stops rotating when the original has been transported a specified distance after the registration sensor had detected the leading edge of the original. From 2nd original, feeding starts after the admission signal to start feeding is received.



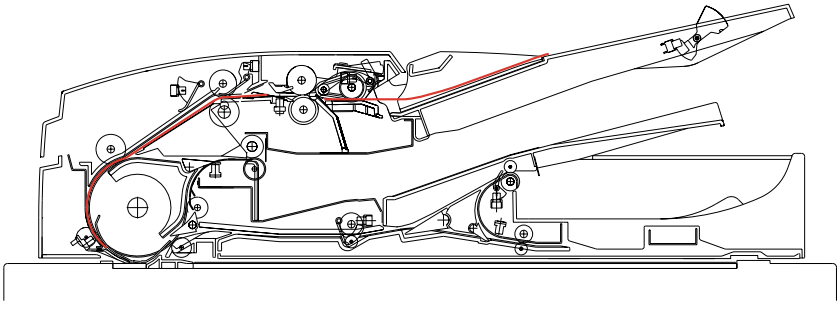
(4) Start of feeding

The feed motor starts to rotate in reverse. After the feed motor has finished accelerating, the read motor starts to rotate forward. With 1st original, both the feed and read motors start to slow down when the leading edge of the original has come to a specified distance before the read sensor.

From 2nd original, the feed motor starts to slow down when the leading edge of the original has come to a specified distance before the 1st roller. The feed motor stops rotating when the original length sensor has detected the trailing edge of the original. At the same time, the tray lift motor starts to rotate to lift the tray. When the tray has come to a specified level after the upper limit sensor had detected the top side of the original, it stops rotating.

The empty sensor detects whether or not there is a next original with a specified delay after the original length sensor has detected the trailing edge of the original. Without a next original, the tray lift motor starts to lower the tray to turn the origianl set signal OFF. When the lower limit sensor has detected the tray, it stops rotating. With a next original, the separation begins at the same time the scanning begins.

When the original has been transported a specified distance by the read motor after the read sensor had detected the leading edge of the original, the read motor stops rotating and the original stop signal turns ON.

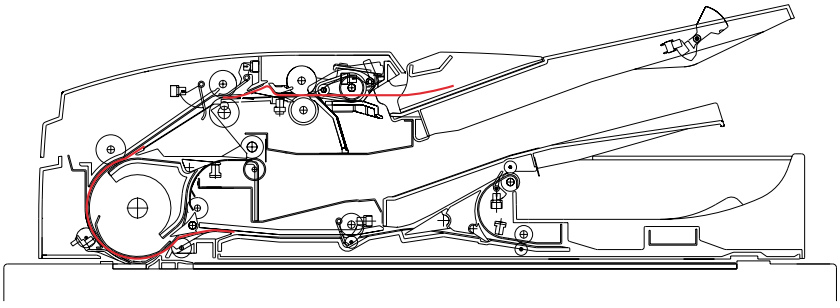


(5) Start of 1st original scanning

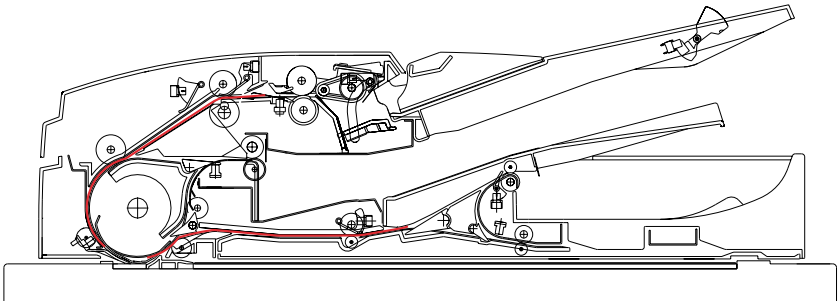
The scanning begins after receiving the original transport signal from the copier. At the same time, the original stop signal is reset. Then the read motor starts to rotate forward and to separate the next original.

The SCN-STR turns ON when the leading edge of the original has reached the scanning section. When it has been transported to the intermediate transport section and come to a specified distance before the intermediate transport roller, the large original exit motor starts to rotate in reverse.

Feeding of 2nd original starts when the original has been transported a specified distance by the read motor after the original length sensor had detected the trailing edge of the original.



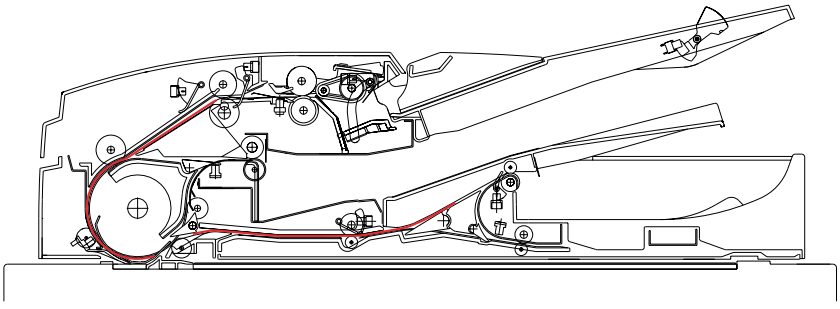
The SCN-STR turns OFF when the trailing edge of the original has passed the scanning section, and before the trailing edge of the original passes the 3rd roller, 2nd original reaches the scanning waiting section and stops being transported.



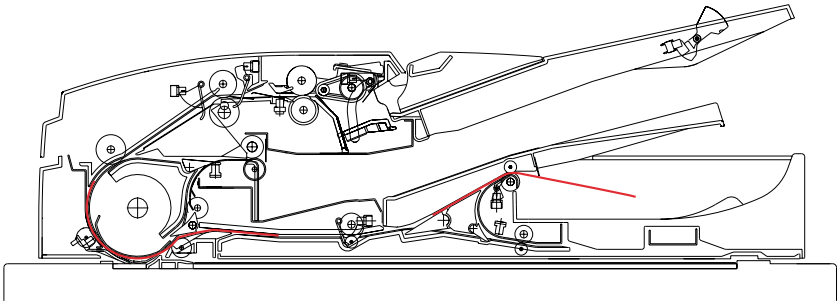
(6) Start of 2nd original scanning

Scanning begins after receiving the original transport signal from the copier. At the same time,the original stop signal is reset. Then the read motor starts to rotate forward and the large original exit motor starts to rotate in reverse.

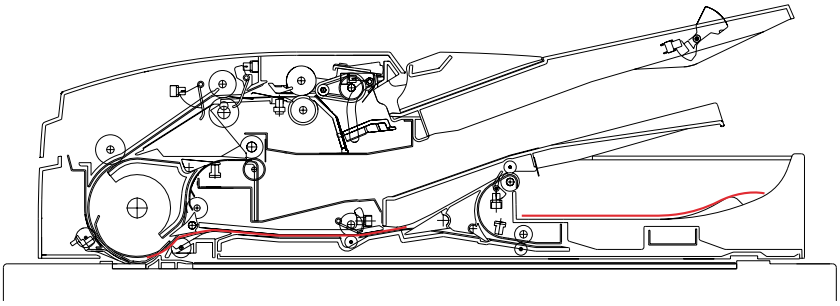
The SCN-SCR turns ON when the leading edge of the original has reached the scanning section. When the trailing edge of 1st original has proceeded a specified distance after passing the 3rd roller, the large original exit motor starts to accelerate.



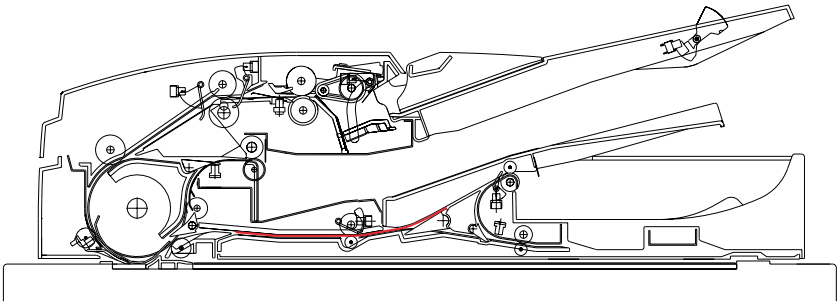
When the leading edge of the original has been transported to the intermediate transport section and come to a specified distance before the intermediate transport roller, The large original exit motor starts to rotate in reverse.



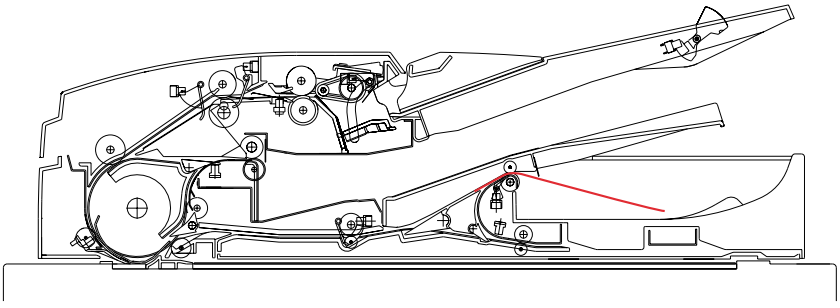
The SCN-SCR turns OFF when the leading edge of the original has reached the scanning section.
When the trailing edge of the original has proceeded a specified distance after passing the 3rd roller, the large original exit motor starts to accelerate.



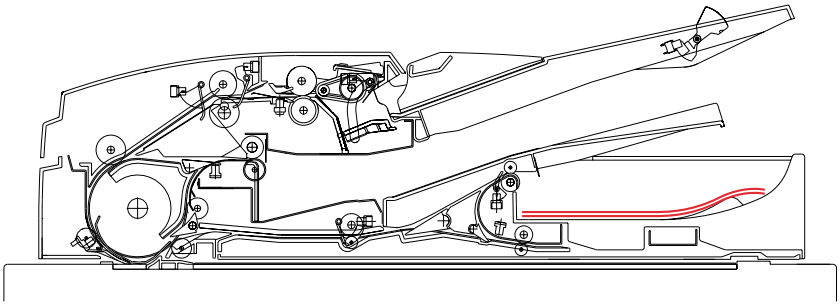
(7) After the original trailing edge has passed the 3rd roller
When the leading edge of the original has come to a specified distance before the small original exit roller, the small original exit motor starts to rotate forward.



When the intermediate transport sensor detects the trailing edge of 1st original, the large original exit motor stops rotating unless the leading edge of 2nd original has come to a given place. If it has, the large original exit motor slows down to the speed of scanning.
When the trailing edge of the original has come to a specified distance before the small original exit roller, the small original exit motor starts to slow down.



When the original has proceeded a specified distance after the small original exit sensor had detected the trailing edge of the original, the small original exit motor stops rotating. Then the operation ends after 2nd original has been discharged.



16. 5. 2. A4 two-sided feeding

(Operational condition: A4 original/Reproduction ratio: 100%)

(1) Original setting

Same operation as 16.5.1.(1)

(2) Lifting of the lifting tray

Same operation as 16.5.1.(2)

(3) Start of separation

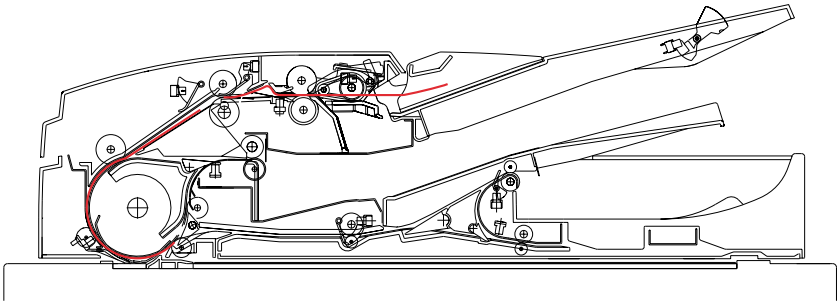
Same operation as 16.5.1.(3)

(4) Start of feeding

Same operation as 16.5.1.(4)

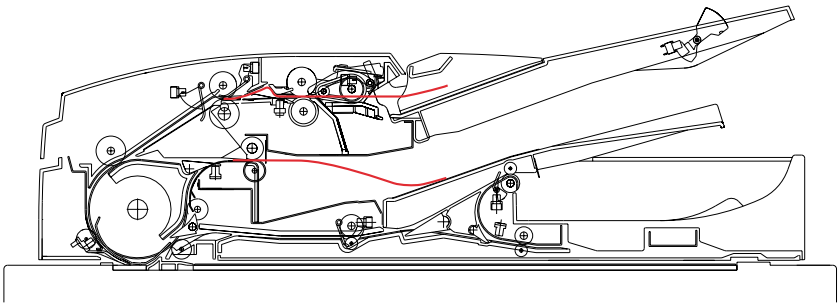
(5) Start of top side scanning

Scanning starts after receiving the original transport signal from the copier. At the same time, the original stop signal is reset. The read motor starts to rotate forward and to separete 2nd original.
When the leading edge of the original has reached the scanning section, both the SCN-STR and the large original exit solenoid turn ON.
When the leading edge of the original has been transported to the large original exit side and reached to the 3rd roller, the large original exit motor starts to rotate in reverse .



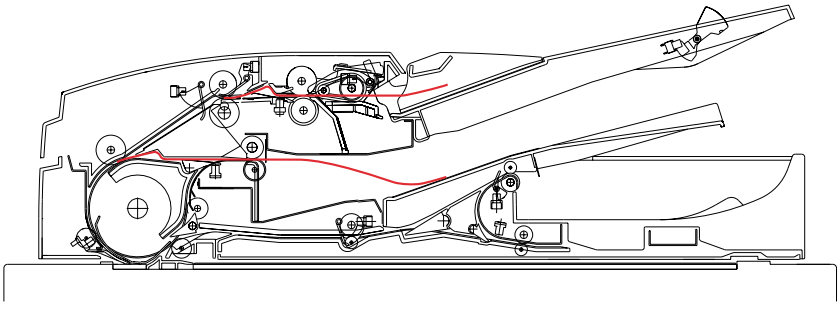
The SCN-STR turns OFF after the trailing edge of the original has passed the scanning section, and at the same time, both the read and large original exit motors start to accelerate. After the trailing edge of the original has passed the 4th roller and proceeded a specified distance, the large original exit motor slows down.
After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. Then the original is nipped by the large original exit roller.

The large original exit solenoid turns OFF when the large original exit motor stops rotating.



(6) Start of 1st original back side registering

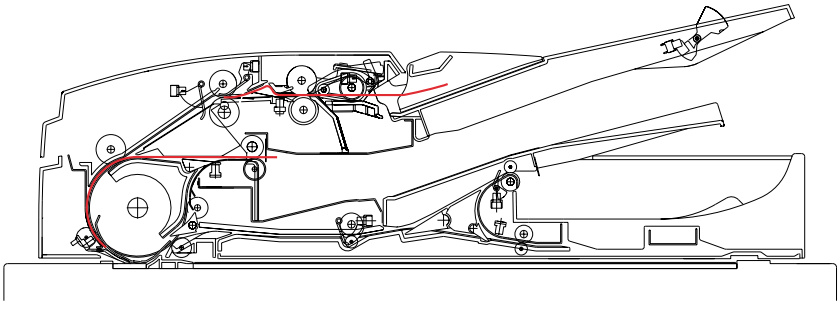
The large original exit motor starts to rotate forward. After the large original exit sensor has detected the leading edge of the original then the original has proceeded a specified distance and been registered, the large original exit motor stops rotating.



(7) Start of 1st original back side feeding

Both the large original exit and read motors start to rotate forward, and when the leading edge of the original has come to a specified distance before the read sensor, they start to slow down.

They stop to rotate when the leading edge of the original has reached the read sensor then the original has been transported a specified distance by the read motor. At the same time, the original stop signal is set.

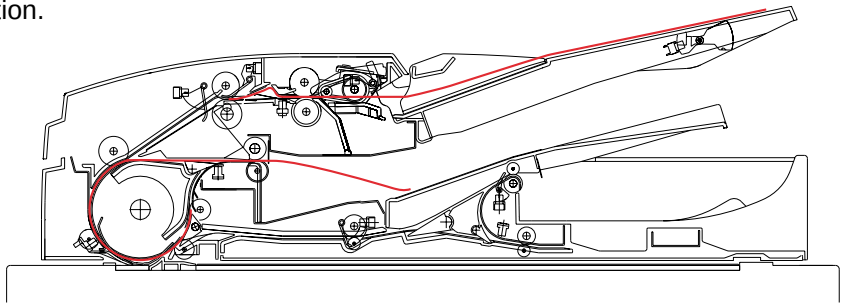


(8) Start of 1st original back side scanning

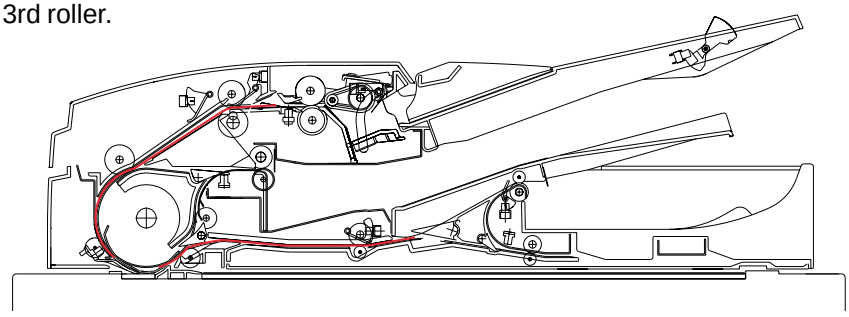
Scanning starts after receiving the original transport signal from the copier. At the same time, the original stop signal is reset. When the read motor starts to rotate forward, the large original exit motor also starts to rotate forward and the disengagement solenoid turns ON.

The SCN-STR turns ON when the leading edge of the original has reached the scanning section. The large original exit motor stops rotating when the disengagement solenoid has turned ON.

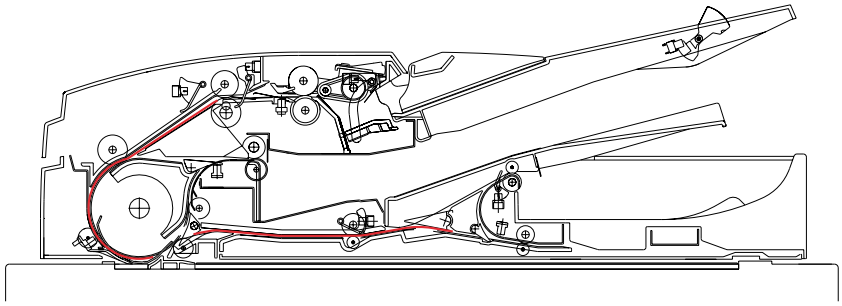
When the leading edge of the original has been transported to the intermediate transport section and come to a specified distance before the intermediate transport roller, the large original exit motor starts to rotate in reverse and the small original exit motor also starts to rotate in reverse and the small original exit solenoid turns ON.
Feeding of the next original starts when the read motor has counted a specified time since the start of the scanning operation.



The SCN-STR turns OFF when the trailing edge of the original has passed the scanning section. At the same time, the disengagement solenoid also turns OFF.
The next original reaches the scanning waiting position and stops before the trailing edge of the original passes the 3rd roller.

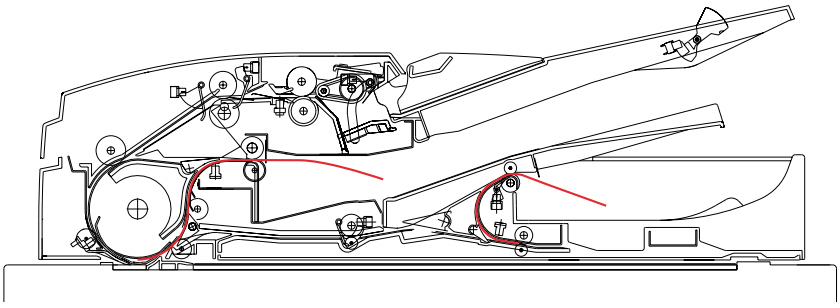


(9) Start of 2nd original back side scanning
Scanning begins after receiving the original transport signal from the copier. At the same time the original stop signal is reset. The read motor starts to rotate forward and the large original exit motor starts to rotate in reverse.
The SCN-STR turns ON when the leading edge of the original has reached the scanning section, and the large original exit solenoid turns ON, too. The large original exit motor starts to accelerate when the trailing edge of 1st original has passed the 3rd roller and prceeded a specified distance.

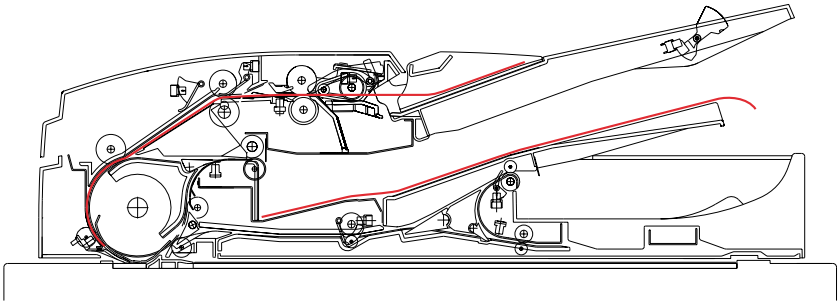


When the leading edge of the original has been transported to the large original exit side and come to the 3rd roller, the disengagement solenoid turns ON. The large original exit motor starts to slow down when the trailing edge of 1st original has passed the intermediate transport roller.

The SCN-STR turns OFF when the trailing edge of the original has passed the scanning section. At the same time, both the read and the large original exit motors start to accelerate and the disengagement solenoid turns OFF.

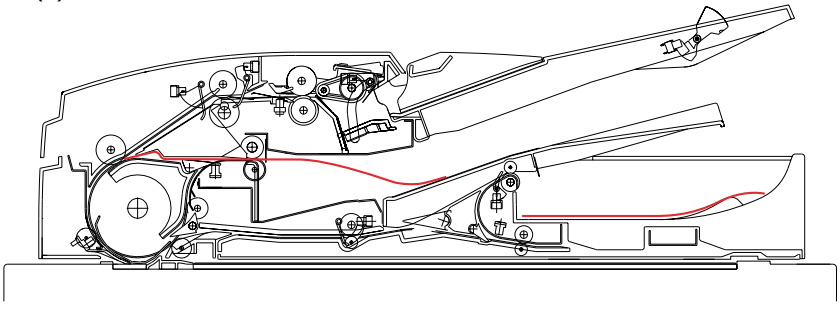


When the trailing edge of the original has passed the 4th roller then proceeded a specified distance, the large original exit motor starts to slow down. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. The large original exit solenoid turns OFF when the large original exit motor stops rotating.



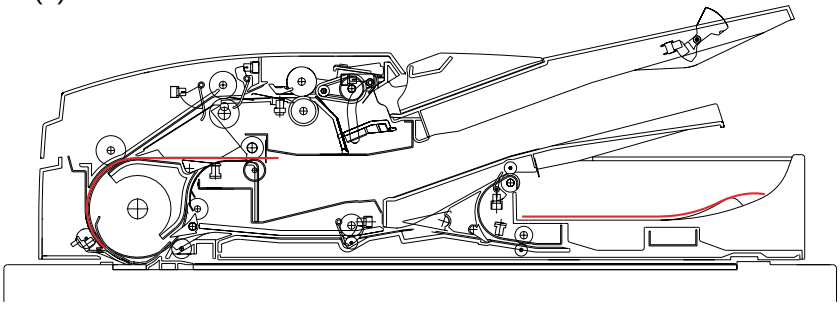
(10) Start of 2nd original back side registering

Same operation as (6)



(11) Start of 2nd original back side feeding

Same operation as (7)

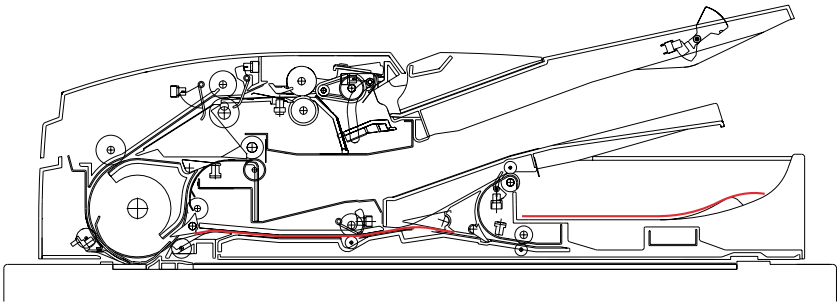


(12) Start of 2nd original back side scanning

Scanning begins after receiving the original transport signal from the copier. At the same time, the original transport signal turns OFF. When the read motor starts to rotate forward, the large original exit motor also starts to rotate forward and the disengagement solenoid turns ON. The SCN-STR turns ON when the leading edge of the original has reached the scanning section. The large original exit motor stops when the disengagement solenoid has turned ON.

When the leading edge of the original has been transported to the intermediate transport section and come to a specified distance before the intermediate transport roller, both the large and small original exit motors start to rotate in reverse. (The small original exit solenoid has been ON from 1st original.)

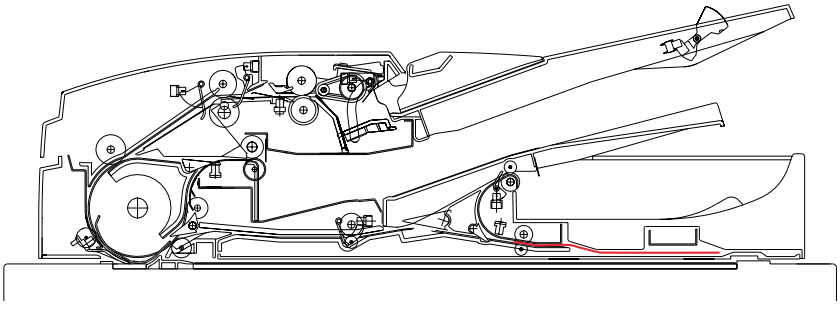
Both the SCN-STR and the disengagement solenoid turn OFF when the trailing edge of the original has passed the scanning section. The large original exit motor starts to accelerate when the trailing edge of the original has passed the 3rd roller and proceeded a specified distance.



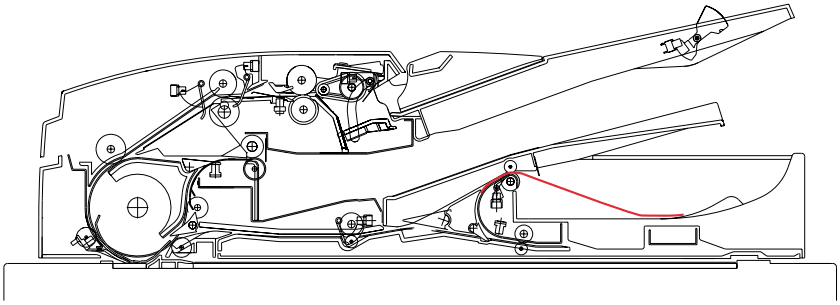
(13) After the original trailing edge has passed the 3rd roller

The large original exit motor stops rotating when the trailing edge of the original has been detected by the intermediate transport sensor then proceeded a specified distance.

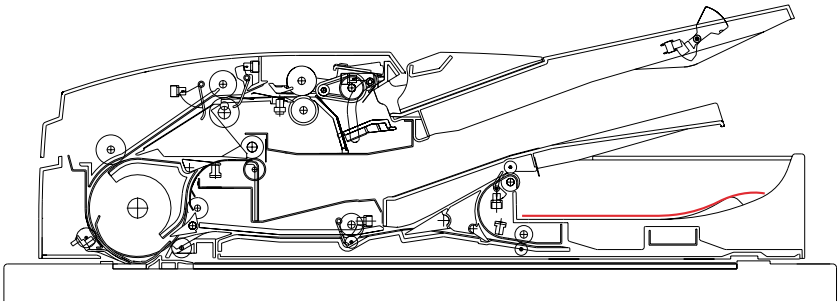
The small original exit motor starts to slow down when the trailing edge of the original has come to a specified distance before the small original reverse sensor. Then it stops rotating when the trailing edge of the original has been detected by the small original reverse sensor and proceeded a specified distance.



The small original exit motor starts to rotate forward. Then it starts to slow down with a specified time delay after the small original reverse sensor has detected the leading edge of the original.



The small original exit motor stops rotating when the trailing edge of the original has been detected by the small original exit sensor then proceeded a specified distance. The small original exit solenoid turns OFF and the operation ends when the original has been discharged.



16. 5. 3. A4 single-sided feeding
(Operational condition: A3 original/Reproduction ratio: 100%)

(1) Original setting

Same operation as 16.5.1.(1)

(2) Lifting of the lifting tray

Same operation as 16.5.1.(2)

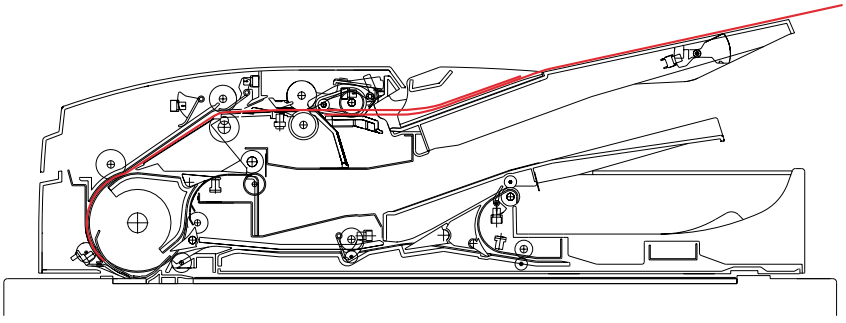
(3) Start of separating

Same operation as 16.5.1.(3)

(4) Start of feeding

The feed motor starts to rotate in reverse. When the feed motor has completed acceleration, the read motor starts to rotate forward. Both the feed and read motors start to slow down when the leading edge of the original has come to a specified distance before the read sensor.

They stop rotating and the original stop signal turns ON when the leading edge of the original has been detected by the read sensor then proceeded a specified distance.



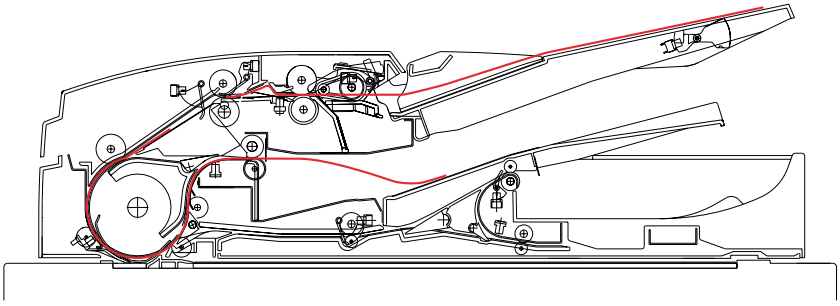
(5) Start of 1st original scanning

Scanning begins after receiving the original transport signal from the copier. At the same time the original stop signal is reset. When the read motor starts to rotate forward, the feed motor also starts to rotate in reverse and the large original exit solenoid turns ON. The SCN-STR turns ON when the leading edge of the original has reached the scanning section.

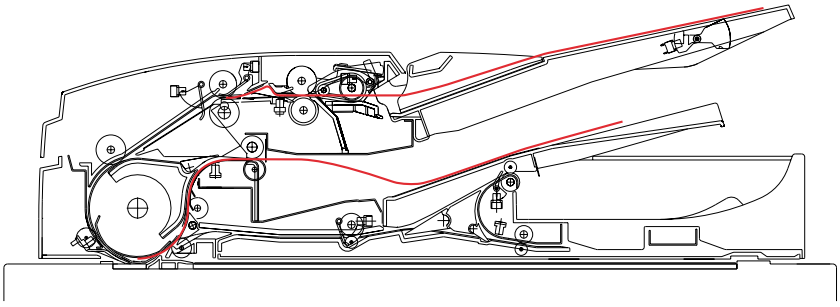
The large original exit motor starts to rotate in reverse when the leading edge of the original has been transported to the large original exit side and come to the 3rd roller.

When the registration sensor has detected the trailing edge of the original, the feed motor stops rotating and the tray lift motor starts to rotate to lift the tray. The tray lift motor stops rotating when a specified number of counts is counted after the upper limit sensor has detected the top side of the original.

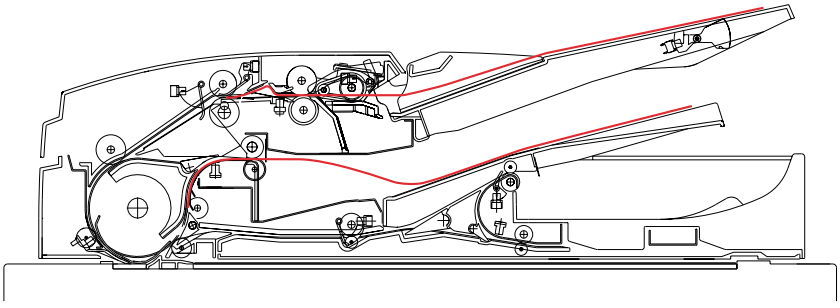
The empty sensor detects whether or not there is a next original when a specified time passes after the registration sensor has detected the trailing edge of the original. With a next original, separating of the next original begins.



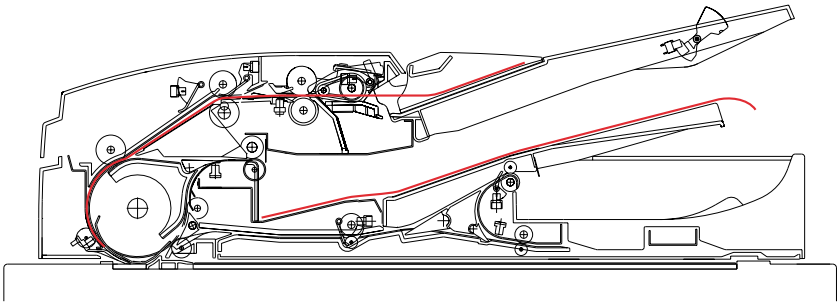
When the trailing edge of the original has passed the scanning section, the SCN-STR turns OFF and both the read and large original exit motors start to accelerate.



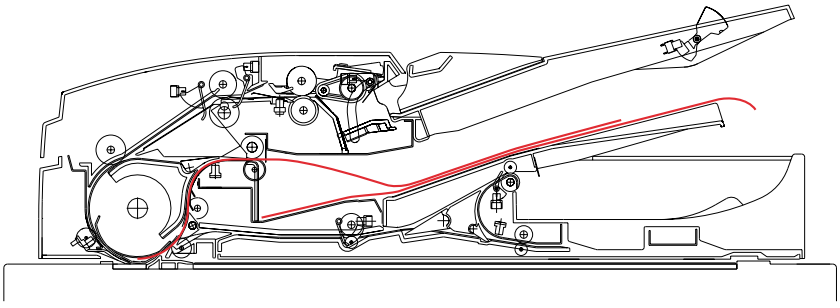
Feeding of 2nd original begins when the trailing edge of the original has passed the 4th roller.



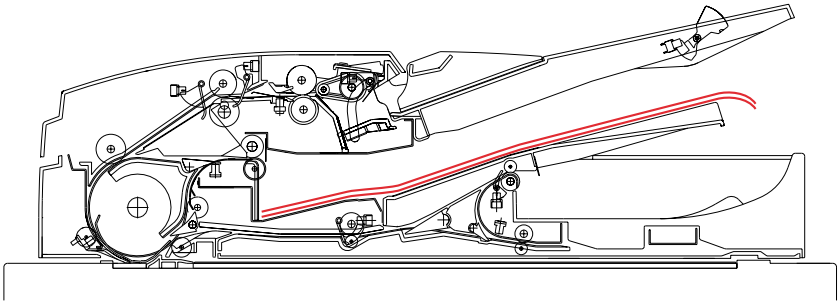
When the trailing edge of the original has passed the 4th roller then proceeded a specified distance, the large original exit motor starts to slow down. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. Then the original is discharged.
Both the read and feed motors stop when 2nd original has reached the scanning waiting section.



(6) Start of 2nd original scanning
Scanning begins after receiving the original transport signal from the copier. At the same time the original stop signal is reset. When the read motor starts to rotate forward, the feed motor also starts to rotate in reverse. (The large original exit solenoid has been ON from 1st original.)
The SCN-STR turns ON when the leading edge of the original has reached the scanning section.
The large original exit motor starts to rotate in reverse when the leading edge of the original has been transported to the large original exit side and come to the 3rd roller.
When the registration sensor has detected the trailing edge of the original, the feed motor stops rotating and the tray lift motor starts to rotate to lift the tray. The tray lift motor stops rotating when a specified number of counts is counted after the upper limit sensor has detected the top side of the original.
The empty sensor detects whether or not there is a next original when a specified time passes after the registration sensor has detected the trailing edge of the original. If not, the tray lift motor starts to rotate to lower the tray and the original set signal turns OFF. The tray lift motor stops rotating when the lower limit sensor has detected the tray.
When the trailing edge of the original has passed the scanning section, the SCN-STR turns OFF and both the read and large original exit motors start to accelerate.



When the trailing edge of the original has passed the 4th roller then proceeded a specified distance, the large original exit motor starts to slow down and the read motor stops rotating.
The large original exit motor stops rotating when the trailing edge of the original has been detected by the large original exit sensor then proceeded a specified distance. The large original exit solenoid turns OFF and the operation ends when the original has been discharged.



16. 5. 4. A3 two-sided feeding
(Operational condition: A3 original/Reproduction ratio: 100%)

(1) Original setting

Same operation as 16.5.1.(1)

(2) Lifting of the lifting tray

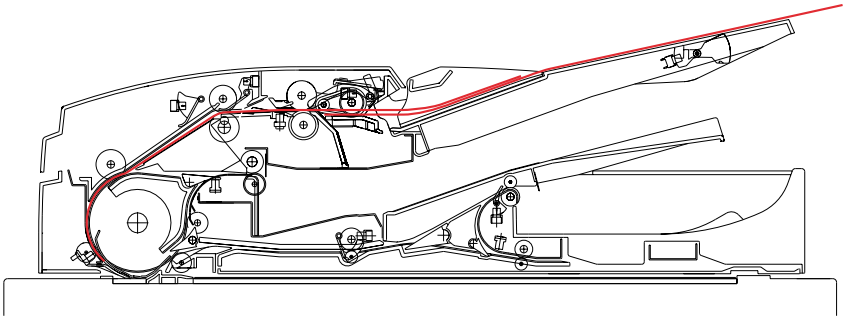
Same operation as 16.5.1.(2)

(3) Start of separation

Same operation as 16.5.1.(3)

(4) Start of feeding

Same operation as 16.5.1.(4)



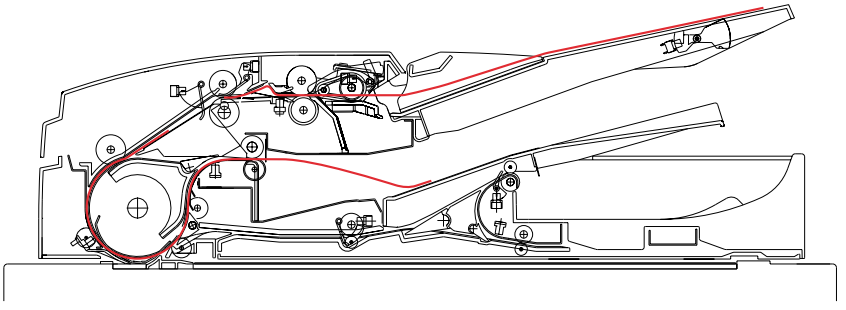
(5) Start of 1st original top side scanning

Scanning begins after receiving the original transport signal from the copier. At the same time the original stop signal is reset. When the read motor starts to rotate forward, the feed motor also starts to rotate in reverse and the large original exit solenoid turns ON. The SCN-STR turns ON when the leading edge of the original has reached the scanning section.

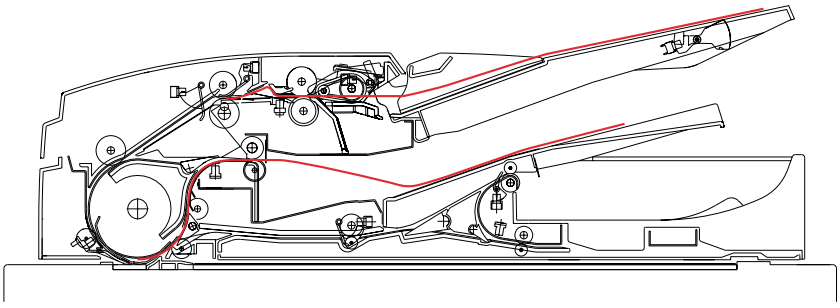
The large original exit motor starts to rotate in reverse when the leading edge of the original has been transported to the large original exit side and come to the 3rd roller.

When the registration sensor has detected the trailing edge of the original, the feed motor stops rotating and the tray lift motor starts to rotate to lift the tray. The tray lift motor stops rotating when a specified number of counts is counted after the upper limit sensor has detected the top side of the original.

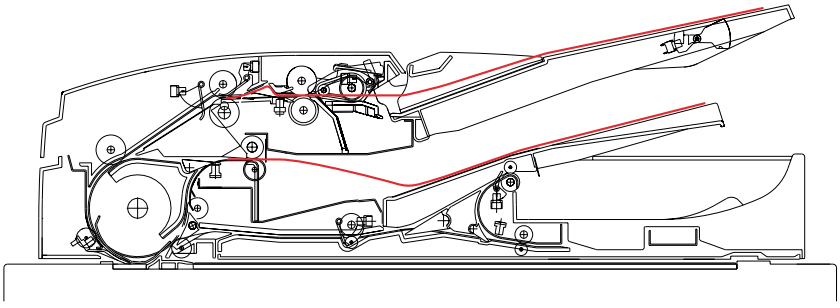
The empty sensor detects whether or not there is a next original when a specified time passes after the registration sensor has detected the trailing edge of the original. With a next original, separating of the next original begins.



When the trailing edge of the original has passed the scanning section, the SCN-STR turns OFF and both the read and large original exit motors start to accelerate.



The large original exit motor slows down when the trailing edge of the original has passed the 4th roller and proceeded a specified distance. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. Then the original is nipped by the large original exit roller.

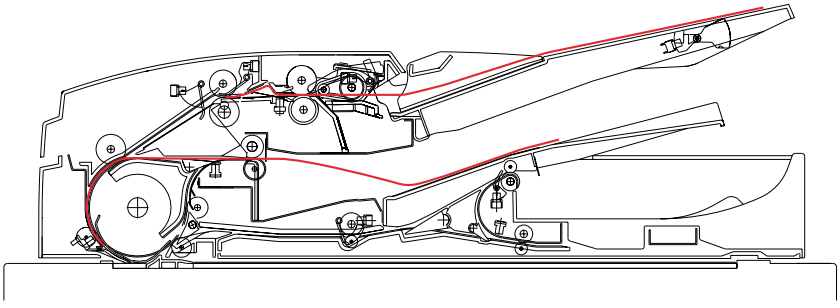


(6) Start of 1st original back side registering

Same operation as 16.5.2.(6)

(7) Start of 1st original back side feeding

Same operation as 16.5.2.(7)

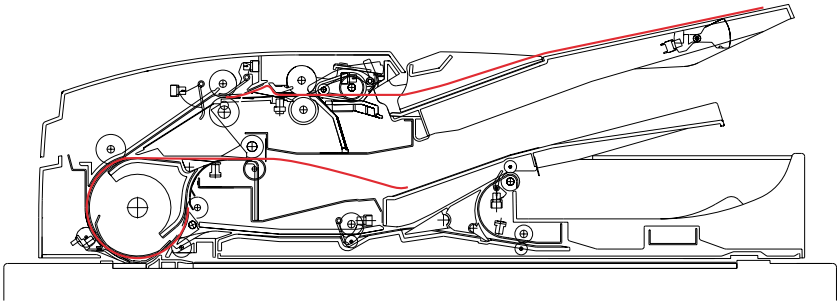


(8) Start of 1st original back side scanning

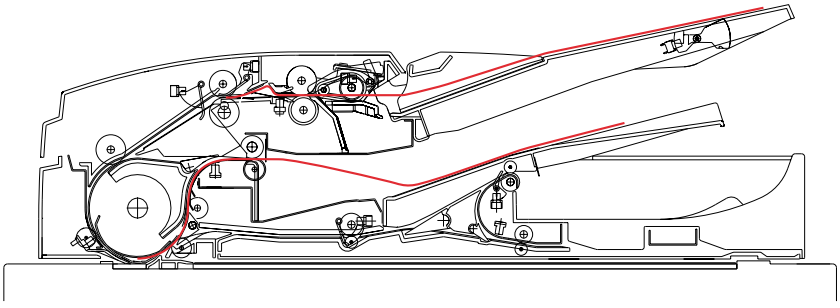
Scanning begins after receiving the original transport signal from the copier. At the same time, the original transport signal is reset. When the read motor starts to rotate forward, the large original exit motor also starts to rotate forward and the disengagement solenoid turns ON. (The large original exit solenoid has been ON from 1st original.)

The SCN-STR turns ON when the leading edge of the original has reached the scanning section. The large original exit motor stops when the disengagement solenoid has turned ON.

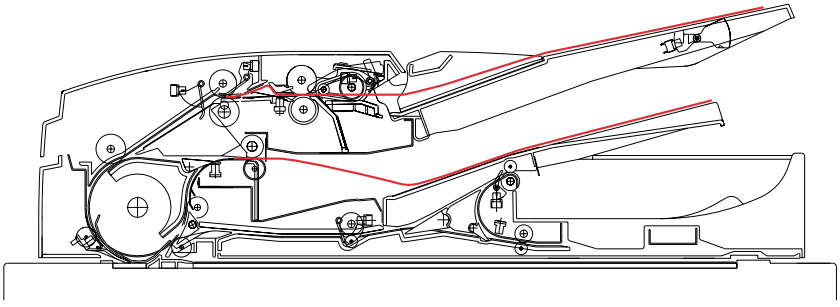
When the leading edge of the original has been transported to the large original exit side and come the 3rd roller, the large original exit motor starts to rotate in reverse .



The SCN-STR turns OFF when the trailing edge of the original has passed the scanning section. At the same time, both the read and large original exit motors start to accelerate and the disengagement solenoid turns OFF.



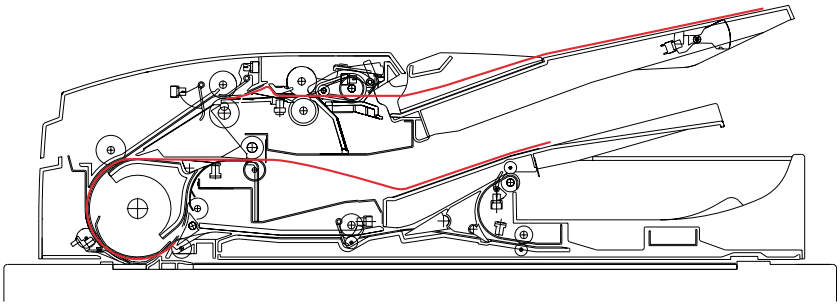
The large original exit motor slows down when the trailing edge of the original has passed the 4th roller and proceeded a specified distance. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. Then the original is nipped by the large original exit roller.



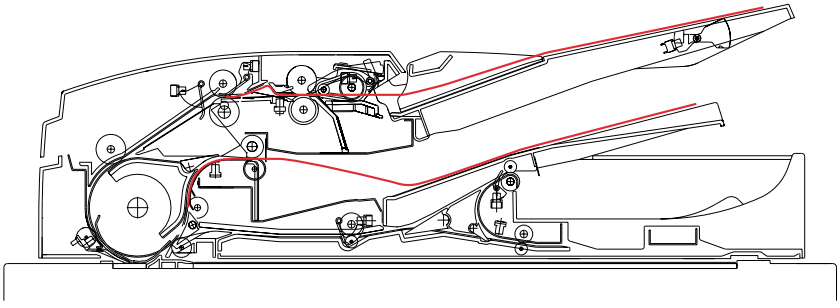
(9) Reversing and discharging of 1st original

Both the large original exit and read motors start to rotate foward. When the leading edge of the original has reached the read sensor then been transported a specified distance by the read motor, the disengagement solenoid turns ON. The large original exit motor stops when the disengagement solenoid has turned ON.

When the leading edge of the original has been transported to the large original exit and reached the 3rd roller, and the large original exit motor starts to rotate in reverse.

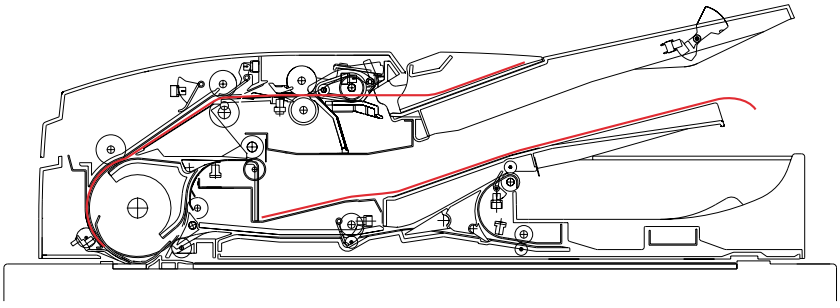


Feeding of 2nd original begins when the trailing edge of the original has passed the 4th roller.(Same operation as 16.5.1(4))



When the trailing edge of the original has passed the 4th roller and proceeded a specified distance, the large original exit motor starts to slow down. When the trailing edge of the original has been detected by the large original exit sensor and proceeded a specified distance, it stops rotating. Then the original is discharged.

Both the read and feed motors stop rotating when 2nd original has reached the scanning waiting position.



(10) Start of 2nd original top side scanning

Scanning begins after receiving the original transport signal from the copier. At the same time the original stop signal is reset. When the read motor starts to rotate forward, the feed motor also starts to rotate in reverse. (The large original exit solenoid has been ON from 1st original.)

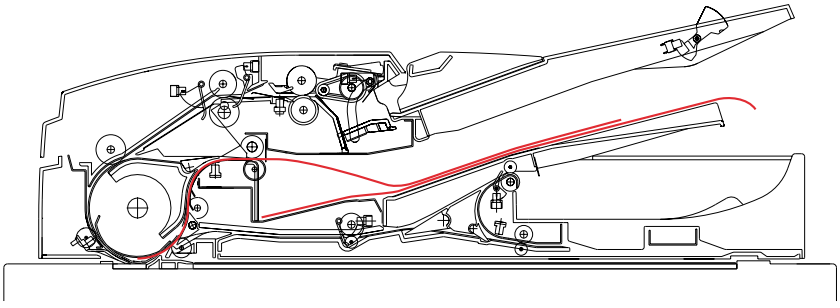
The SCN-STR turns ON when the leading edge of the original has reached the scanning section.

The large original exit motor starts to rotate in reverse when the leading edge of the original has been transported to the large original exit side and come to the 3rd roller.

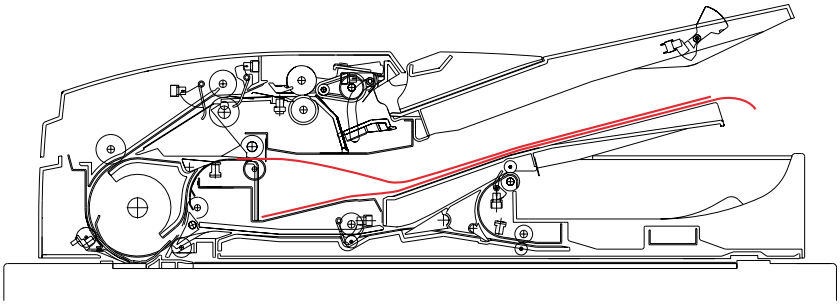
When the registration sensor has detected the trailing edge of the original, the feed motor stops rotating and the tray lift motor starts to rotate to lift the tray. The tray lift motor stops rotating when a specified number of counts is counter after the upper limit sensor has detected the top side of the original.

The empty sensor detects whether or not there is a next original when a specified time passes after the registration sensor has detected the trailing edge of the original. If not, the tray lift motor starts to rotate to lower the tray and the original set signal is reset. The tray lift motor stops rotating when the lower limit sensor has detected the tray.

When the trailing edge of the original has passed the scanning section, the SCN-STR turns OFF and both the read and large original exit motors start to accelerate.



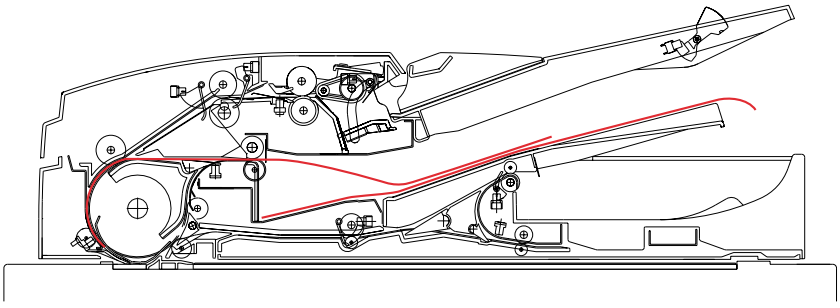
The large original exit motor slows down when the trailing edge of the original has passed the 4th roller and proceeded a specified distance. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. Then the original is nipped by the large original exit roller.



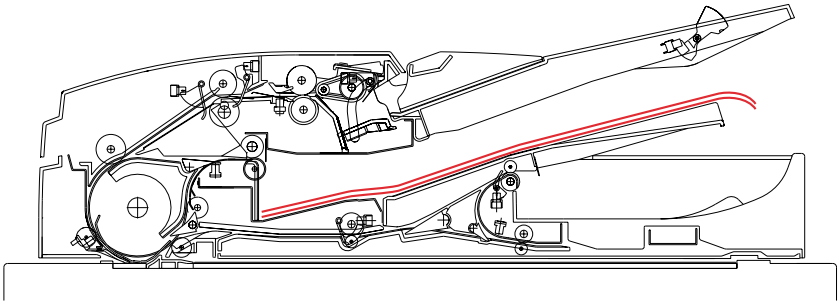
(11) Start of 2nd original back side registering
Same operation as 16.5.2.(6)

(12) Start of 2nd original back side feeding
Same operation as 16.5.2.(7)

(13) Start of 2nd original back side scanning
Same operation as 16.5.2.(8)



(14) Idle reversing and discharging of 2nd original
Both the large original exit and read motors start to rotate foward. When the leading edge of the original has reached the read sensor then been transported a specified distance by the read motor, the disengagement solenoid turns ON. The large original exit motor stops when the disengagement solenoid has turned ON.
When the leading edge of the original has been transported to the large original exit side and reached the 3rd roller and, the large original exit motor starts to rotate in reverse.
The large original exit motor starts to slow down when the trailing edge of the original has passed the 4th roller and proceeded a specified distance. The read motor stops rotating without a next original.
The large original exit motor stops rotating when the trailing edge of the original has been detected by the large original exit sensor and proceeded a specified distance. The large original exit solenoid turns OFF and the operation ends when the original has been discharged.



16. 5. 5. Single-sided feeding at mixed-original mode (Operational condition: A4-R and FOLIO originals/Reproduction rario: 100%)

(1) Original setting

Same operation as 16.5.1.(1)

(2) Lift of the lifting tray

Same operation as 16.5.1.(2)

(3) Start of separation

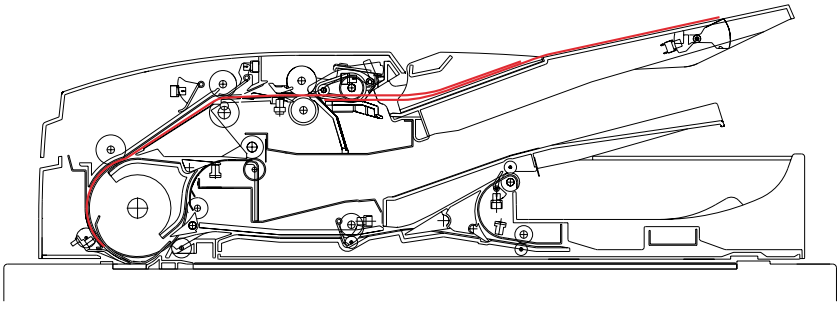
Same operation as 16.5.1.(3)

(4) Start of feeding

The feed motor starts to rotate in reverse. After the feed motor has finished accelerating, the read motor starts to rotate forward.

Both the feed and read motors start to slow down when the leading edge of the original has come to a specified distance before the read sensor.

The original is transported a specified distance by the read motor after the read sensor detects the leading edge of the original. Then after the original size is detected and the idle reversing is judged to be necessary, both the feed and read motors start to accelerate and the large original exit solenoid turns ON.

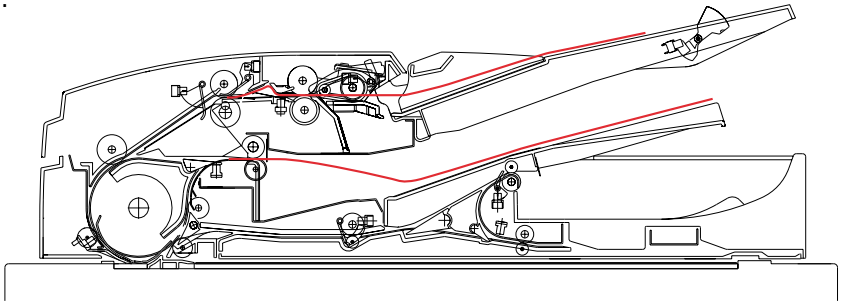


The large original exit motor starts to rotate in reverse when the leading edge of the original has been transported to the large original exit side and passed the 3rd roller.

When the registration sensor detects the trailing edge of the original, the feed motor stops rotating and the tray lift motor starts to rotate to lift the tray. Then the tray lift motor stops lifting the tray when a specified number of counts is counted after the upper limit sensor has detected the top side of the original.

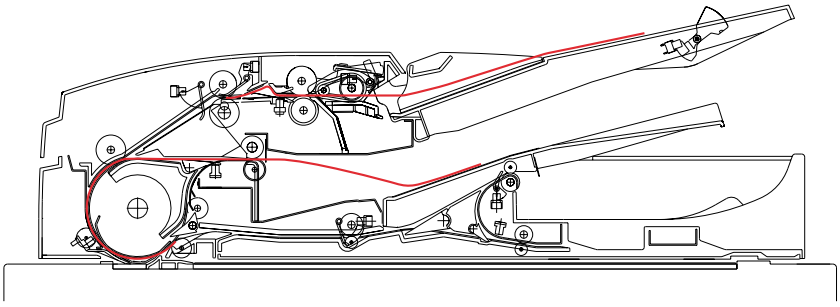
The empty sensor detects whether or not there is a next original when a specified time passes after the the registration sensor has detected the trailing edge of the original. With a next original, separating begins. Without it, the tray lift motor starts to rotate to lower the tray and the original set signal is reset. The tray lift motor stops rotating when the lower limit sensor has detected the tray.

The large original exit motor starts to slow down when the trailing edge of the original has proceeded a specified distance after passing the 4th roller. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. The original is nipped by the large original exit roller.

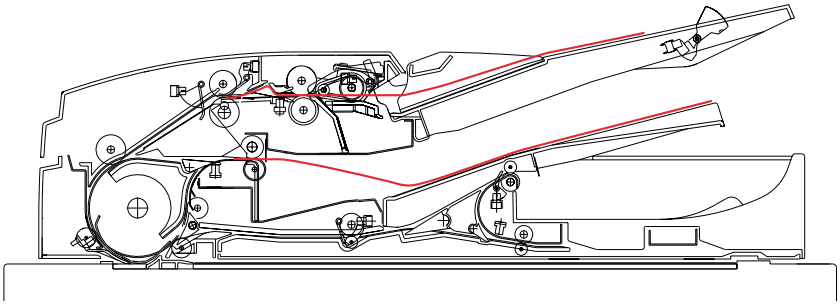


(5) Start of back side registering
Same operation as 16.5.2.(6)

(6) Start of back side feeding
Both the large original exit and read motors start to rotate forward. After the leading edge of the original has reached the read sensor and been transported a specified distance by the read motor, the disengagement solenoid turns ON. Then the large original exit motor stops rotating.
The large original exit motor starts to rotate in reverse after the original has been transported to the large original exit and the leading edge of the original has reached the 3rd roller.



The large original exit motor starts to slow down when the trailing edge of the original has proceeded a specified distance after passing the 4th roller. After the large original exit sensor has detected the trailing edge of the original, the read motor stops rotating soon and the large original exit motor stops rotating when the original has proceeded a specified distance. The original is nipped by the large original exit roller.

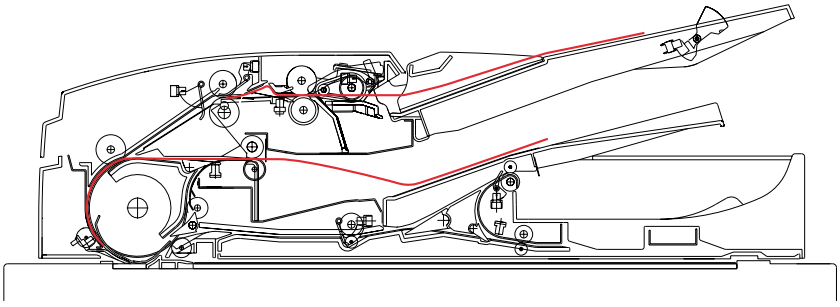


(7) Back side registering to set the top side

Same operation as 16.5.2.(6)

(8) Start of top side feeding

Same operation as 16.5.2.(7)

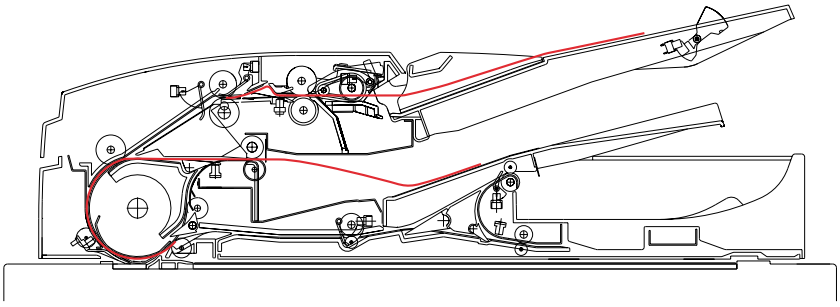


(9) Start of scanning

Scanning begins after receiving the original transport signal from the copier, and at the same time, the original stop signal is reset. The read motor starts to rotate foward and so does the large original exit motor. Then the disengagement solenoid turns ON. (The large original exit solenoid has been ON since the original was idle reversed.)

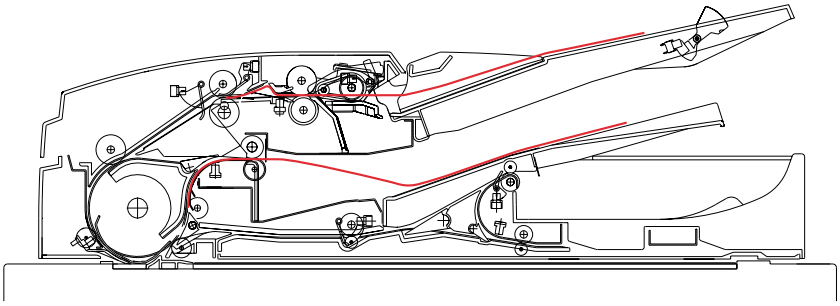
The SCN-STR turns ON when the leading edge of the original has reached the scanning section.

When the leading edge of the original is transported to the large original exit and reaches the 3rd roller, the large original exit motor starts to rotate in reverse.



When the trailing edge of the original has passed the scanning section, the SCN-STR turns OFF, and at the same time, both the read and large original exit motors start to accelerate. Then the disengaEgement solenoid turns OFF.

With a next original, feeding of the original begins when the trailing edge of the original has passed the 4th roller.



The large original exit motor starts to slow down when the trailing edge of the original has proceeded a specified distance after passing the 4th roller. At the same time, the read motor stops rotating unless there is a next original.
The large original exit motor stops rotating when the trailing edge of the original has proceeded a specified distance after being detected by the large original exit sensor. Then the original is discharged. If this is the last original, the operation ends when the large original exit solenoid turns OFF.

16. 6. Jams

16. 6. 1. Jams at feeding section

(1) Original jammed not reaching the original length sensor

- Jam detection

  This jam is detected during the time after the feed motor begins to rotate forward to start separation until an original reaches the original length sensor.

- Jam timer setting

  The setting value for the jam timer is three times as much time as it takes to transport an original from the pickup position (where the empty sensor detects the original) to the original length sensor.

(2) Original jammed not reaching the registration sensor

- Jam detection

  This jam is detected during the time after an original comes to the position 10mm short of the registration sensor (24.6mm further from the original length sensor) until it reaches the registration sensor.

- Jam timer setting

  The setting value for the jam timer is three times as much time as it takes to transport an original from the middle position between the original length sensor and registration sensor to the registration sensor.

16. 6. 2. Jams at transporting section

(1) Original jammed at the original length sensor

- Jam detection

  This jam is detected during time after the feed motor starts to rotate in reverse so that the registration roller starts to transport an original to the read roller until the trailing edge of the original passes through the original length sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for the longest original (LD) to pass through the original length sensor and proceed more 60mm.

(2) Original jammed at the registration sensor

- Jam detection

  This jam is detected during the time after the original passes through the original length sensor until it passes through the registration sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the original length sensor to the registration sensor plus 60mm.

(3) Original jammed not reaching the read sensor

- Jam detection

  This jam is detected during the time after an original comes to the 1st roller until it reaches the read sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the 1st roller to the read sensor plus 60mm.

(4) Original jammed at the read sensor (from the feeding side)

- Jam detection

  This jam is detected during the time after an original passes through the 1st roller until it passes through the read sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the 1st roller to the read sensor plus 30mm.

(5) Original jammed at the read sensor (from the large original exit side)

- Jam detection

  This jam is detected during the time after the scanning of an original from the large original exit side set at the scanning position until the original passes through the read sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for the longest original (LD) to pass through the read sensor and proceed more 30mm.

16. 6. 3. Jams at large original exit section

(1) Original jammed not reaching the large original exit sensor (while discharging)

- Jam detection

  This jam is detected during the time after an original comes to the 4th roller until it reaches the large original exit sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the 4th roller to the large original exit sensor plus 30mm.

(2) Original jammed at the large original exit sensor (while discharging)

- Jam detection

  This jam is detected during the time after the leading edge of an original passes the position 20mm further from the 4th roller until it passes through the large original exit sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for the leading edge of an original to proceed the distance from the position 20mm further from the 4th roller to the end of the large original exit sensor plus 60mm.

(3) Original jammed not reaching the large original exit sensor (while registering the back side)

- Jam detection

  This jam is detected during the time after the back side registration or transportation to the 1st roller starts untill an original reaches the large original exit sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the large original exit roller to the large original exit sensor plus 60mm.

16. 6. 4. Jams at small original reverse section

(1) Original jammed not reaching the small original reverse sensor
(to the small original reverse side)

- Jam detection

  This jam is detected during the time after an original reaches the intermediate transport roller until it reaches the small original reverse sensor.

- Jam pulse setting

  The setting value of the jam pulse is equivalent number of pulses it takes for an original to proceed the distance from the intermediate transport roller to the small original reverse sensor plus 60mm.

(2) Original jammed at the small original reverse sensor (to the small original reverse side)

- Jam detection

  This jam is detected during the time after the deceleration, which is set to finish at the position 20mm short of the small original reverse sensor, starts until an original passes through the small original reverse sensor.

- Jam timer setting

  The setting value for the jam timer is the time mentioned above plus necessary time for an original to proceed 60mm.

(3) Original jammed not reaching the small original reverse sensor
(from the small original reverse side to the small original exit side)

- Jam detection

  This jam is detected during the time after discharging starts at the small original reverse section until an original reaches the small original reverse sensor.

- Jam timer setting

  The setting value for the jam timer is three times as much time as mentioned above.

(4) Original jammed at the small original exit sensor
(from the small original reverse side to the small original exit side)

- Jam detection

  This jam is detected during the time after an original reaches the small original exit sensor until it passes through the small original reverse sensor.

- Jam timer setting

  The setting value for the jam timer is 1.5 times as much time as it takes for an LT, which is the longest original (of all kinds of small-sized paper) when discharging small originals, to pass through the small original reverse sensor.

16. 6. 5. Jams at small original exit section

(1) Original jammed not reaching the small original exit sensor
(from the intermediate transport section side)

- Jam detection

  This jam is detected during the time after an original reaches the intermediate transport roller until it reaches the small original exit sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the intermediate transport roller to the small original exit sensor plus 60mm.

(2) Original jammed at the small original exit sensor (from the intermediate transport section side)

- Jam detection

  This jam is detected during the time after the deceleration, which is set to finish at the position 20mm short of the small original exit sensor, starts until an original passes through the small original exit sensor.

- Jam timer setting

  The setting value for the jam timer is the time mentioned above plus necessary time for an original to proceed 60mm.

(3) Original jammed not reaching the small original exit sensor (from the small original reverse side)

- Jam detection

  This jam is detected during the time after an original reaches the small original reverse sensor until it reaches the small original exit sensor.

- Jam timer setting

  The setting value for the jam timer is the time mentioned above plus necessary time for an original to proceed 60mm.

(4) Original jammed at the small original exit sensor (from the small original reverse side)

- Jam detection

  This jam is detected during the time after the deceleration, which is set to finish at the position 20mm short of the small original exit sensor, starts until an original passes through the small original exit sensor.

- Jam timer setting

  The setting value for the jam timer is the time mentioned above plus necessary time for an original to proceed 60mm.

16. 6. 6. Jams at intermediate transport section

(1) Original jammed not reaching the intermediate transport sensor

- Jam detection

  This jam is detected during the time after an original reaches the 3rd roller until it reaches the intermediate transport sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for an original to proceed the distance from the 3rd roller to the intermediate transport sensor plus 30mm.

(2) Original jammed at the intermediate transport sensor

- Jam detection

  This jam is detected during the time after the trailing edge of an original passes the position 20mm further from the 3rd roller until it has passed through the intermediate transport sensor.

- Jam pulse setting

  The setting value for the jam pulse is the equivalent number of pulses it takes for the trailing edge of an original to proceed the distance from the position 20mm further from the 3rd roller to the intermediate transport sensor plus 60mm.

16. 7. Errors

Errors can be divided into the sensor adjustment error, EEPROM error and tray lift motor error.

(1) Sensor adjustment error

There are 4 kinds of sensor adjustment errors:

1) Original length sensor adjustment error

2) Read sensor adjustment error

3) Large original exit sensor adjustment error

4) Small original reverse sensor adjustment error

The D/A output voltage is adjusted so that the A/D input voltage for each sensor is kept within the range between 3.16V~3.55V while carrying out the EEPROM initialization and all-sensor adjust ment at the adjustment mode. At this time, the sensor adjustment error occurs when the D/A output voltage cannot be adjusted within the range between 0.04V~2.90V.

(2) EEPROM error

The EEPROM error occurs when the initialization value cannot be written on the EEPROM while carrying out the EEPROM initialization and all-sensor adjustment at the adjustment mode or when data cannot be read out from the EEPROM after turning ON the power.

(3) Tray lift motor error

The tray lift motor error occurs when a feeding jam because of which the upper limit/lower limit cannot be detected within a specified time while lifting/lowering the tray takes place 3 times continuously.

16. 8. Original Size Detection

The original position base code is transmitted to the copier during the time after the feed signal is sent until 1st original passes through the original width sensor. The original size is detected whenever feeding an original and transmitted to the copier as a code before scanning starts.

16. 8. 1. Original size detection method

(1) Original position base code

The tray guide width is measured and stored when the feed signl is received. Altering of the tray guide position during the operation is ignored.

(2) Width direction size

The status of the original width sensor 1~3 are stored when the leading edge of an original reaches the position 10mm further from the 1st roller after feeding has started with the original at the pre-feeding position.

(3) Feeding direction size

When the leading edge of an original reaches the position 7mm further from the read sensor, the original size is decided by considering the information whether or not the original length sensor is ON, original position base code and status of the original width sensor 1~3. Then it is transmitted to the copier. However, when the original length sensor is ON at the mixed-original mode, the original size for some combinations cannot be decided. In this case, the size is decided by taking into consideration the feed motor pulses counted during the time after the original is idle reversed until it passes through the original length sensor and transmitted to the copier.

16. 8. 2. Original size detection chart

A4 series

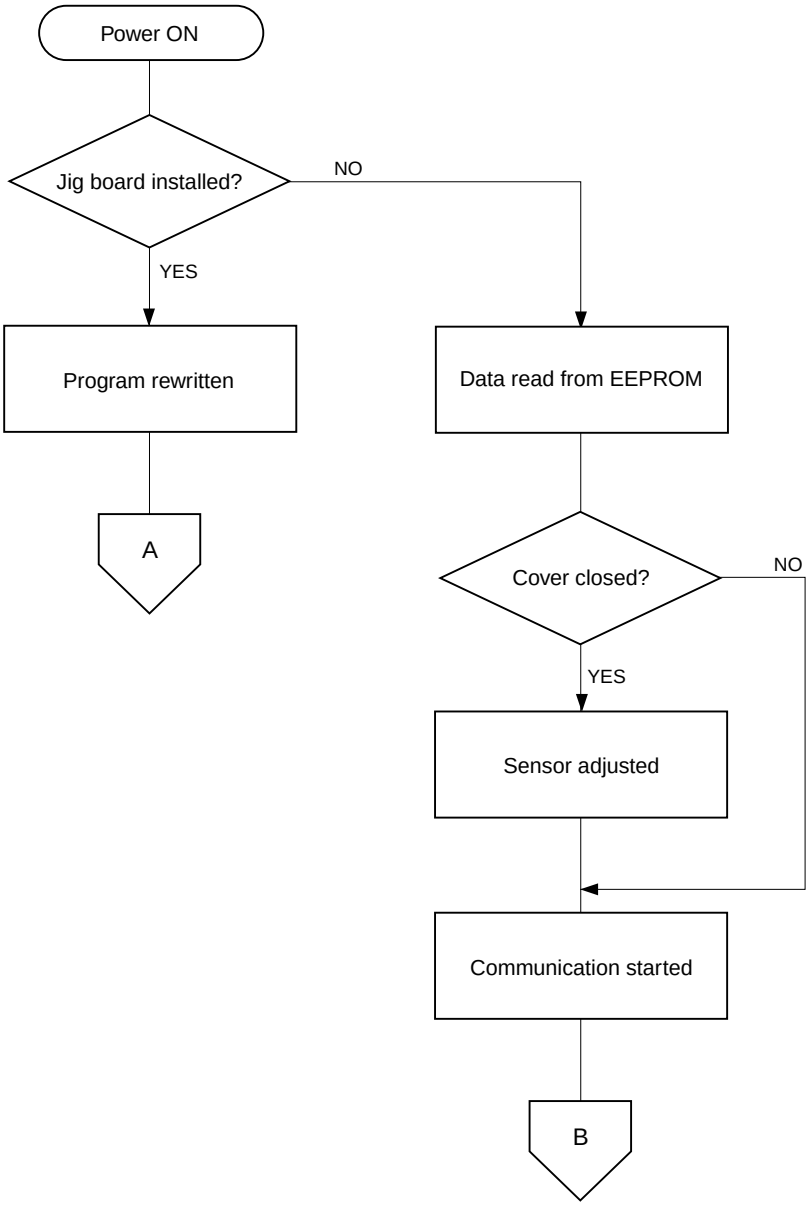
Not over 160mm?	Tray guide width detected receiving ORG-IN (mm)	Tray guide width decided receiving ORG-IN (mm)	Original length sensor at scanning standby position	Size 2 (width 268.4 mm or over)	Size 1 (Width 196.0 mm or over)	Mixed originals mode?	Tray sensor receiving ORG-IN	Switch back pro-hibited?	Reversal without reading length detected (mm)	Reversal without reading length decided (mm)	Size (288.2 mm or over)	Size decided
NO	~114	79										A5-R
	~165	148	OFF									A5-R
			ON									B5-R
	~196	182	OFF									A5-R
			ON	OFF	OFF							B5-R
				OFF	ON							B5-R
	~234	210	OFF									A4
			ON	OFF	OFF							B5-R
				OFF	ON	NO	OFF					A4-R
							ON					FOLIO
						YES		NO	~314	297		A4-R
									~357	330		FOLIO
									357~	384		A3
								YES				A4-R
	~268	257	OFF	OFF	OFF							B5
			ON						~277	257		B5-R
									~314	297		A4-R
									~357	330		FOLIO
									357~	384		A3
				OFF	ON							B4
				ON								B4
	268~	279	OFF	OFF	OFF							B5
				OFF	ON							B5
				ON							OFF	LT
											ON	A4
			ON	OFF	OFF	NO	OFF					A4-R
							ON					FOLIO
						YES		NO	~314	297		A4-R
									~357	330		FOLIO
									357~	384		A3
								YES				A4-R
				OFF	ON							B4
				ON							OFF	LD
											ON	A3
YES	~114	79										A5-R
	114~	148										A4-R

LT series

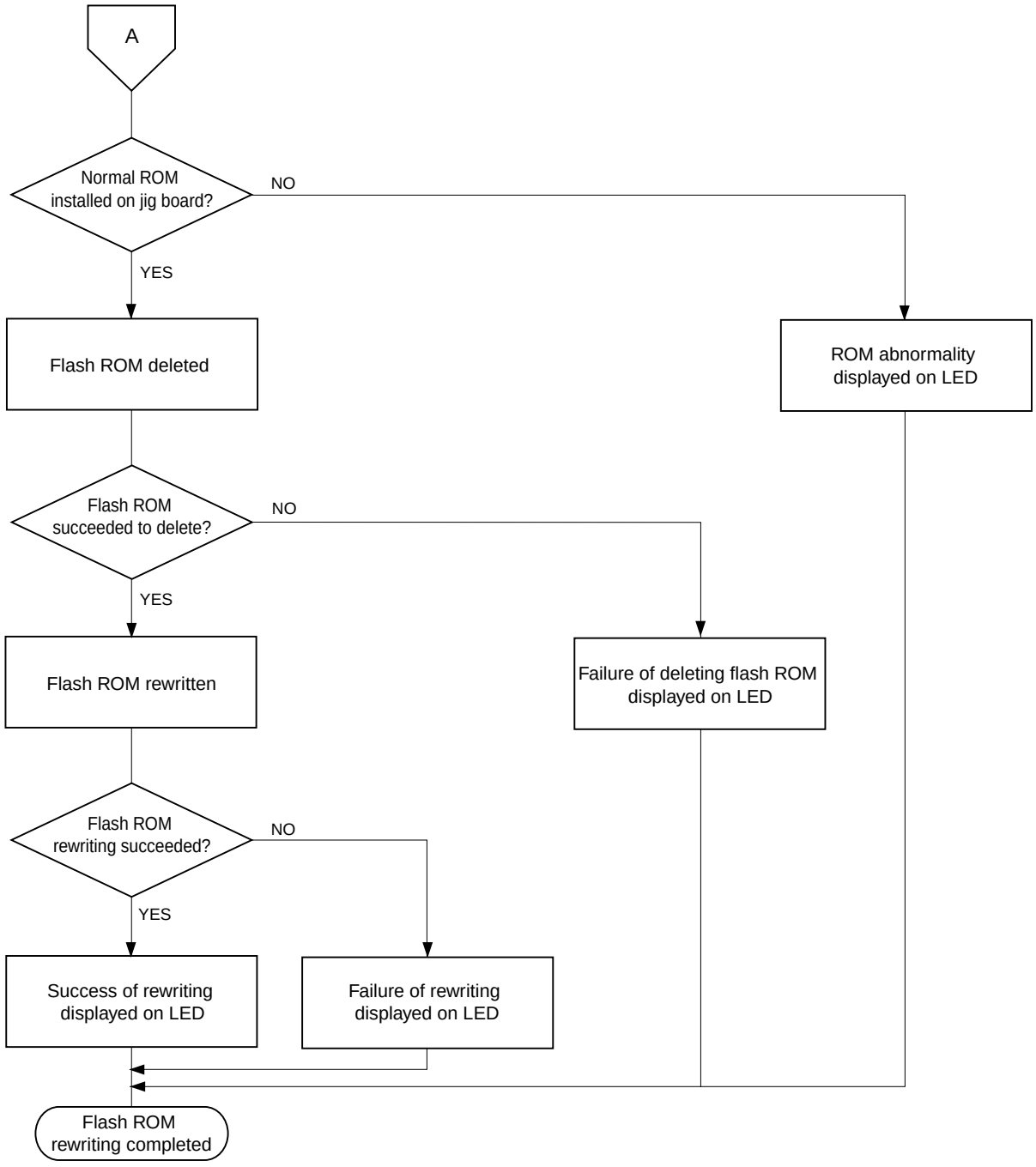
Not over 160mm?	Tray guide width detected receiving ORG-IN (mm)	Tray guide width decided receiving ORG-IN (mm)	Original length sensor at scanning standby position	Size 2 (Width 268.4mm or over)	Size 1 (Width 196.0 mm or over)	Mixed originals mode?	Tray sensor receiving ORG-IN	Switch back pro-hibited?	Reversal without reading length detected (mm)	Reversal without reading length decided (mm)	Size (Width 288.2 mm or over)	Size decided
NO	~110	79										ST-R
	~178	140	OFF									ST-R
			ON									LD
	~237	216	OFF									8.5"x8.5"
			ON	OFF	OFF							LT-R
				ON	ON	NO	OFF					LT-R
							ON					LG
						YES			~305	279		LT-R
									~343	330		13"LG
									~394	356		LG
									394~	432		LD
	~268	257	OFF	OFF	OFF							8.5"x8.5"
				OFF	ON							8.5"x8.5"
				ON								LT
			ON	OFF	OFF	NO	OFF					LT-R
							ON					LG
						YES			~305	279		LT-R
									~343	330		13"LG
									~394	356		LG
									394~	432		LD
				OFF	ON							COMP
				ON								COMP
	268~	279	OFF	OFF	OFF							8.5"x8.5"
				OFF	ON							LT
				ON							OFF	LT
											ON	A4
			ON	OFF	OFF	NO	OFF					LT-R
							ON					LG
						YES			~305	279		LT-R
									~343	330		13"LG
									~394	356		LG
									394~	432		LD
				OFF	ON							COMP
				ON							OFF	LD
											ON	A3
YES	~110	79										ST-R
	110~	140										LT-R

16. 9. Flow Chart

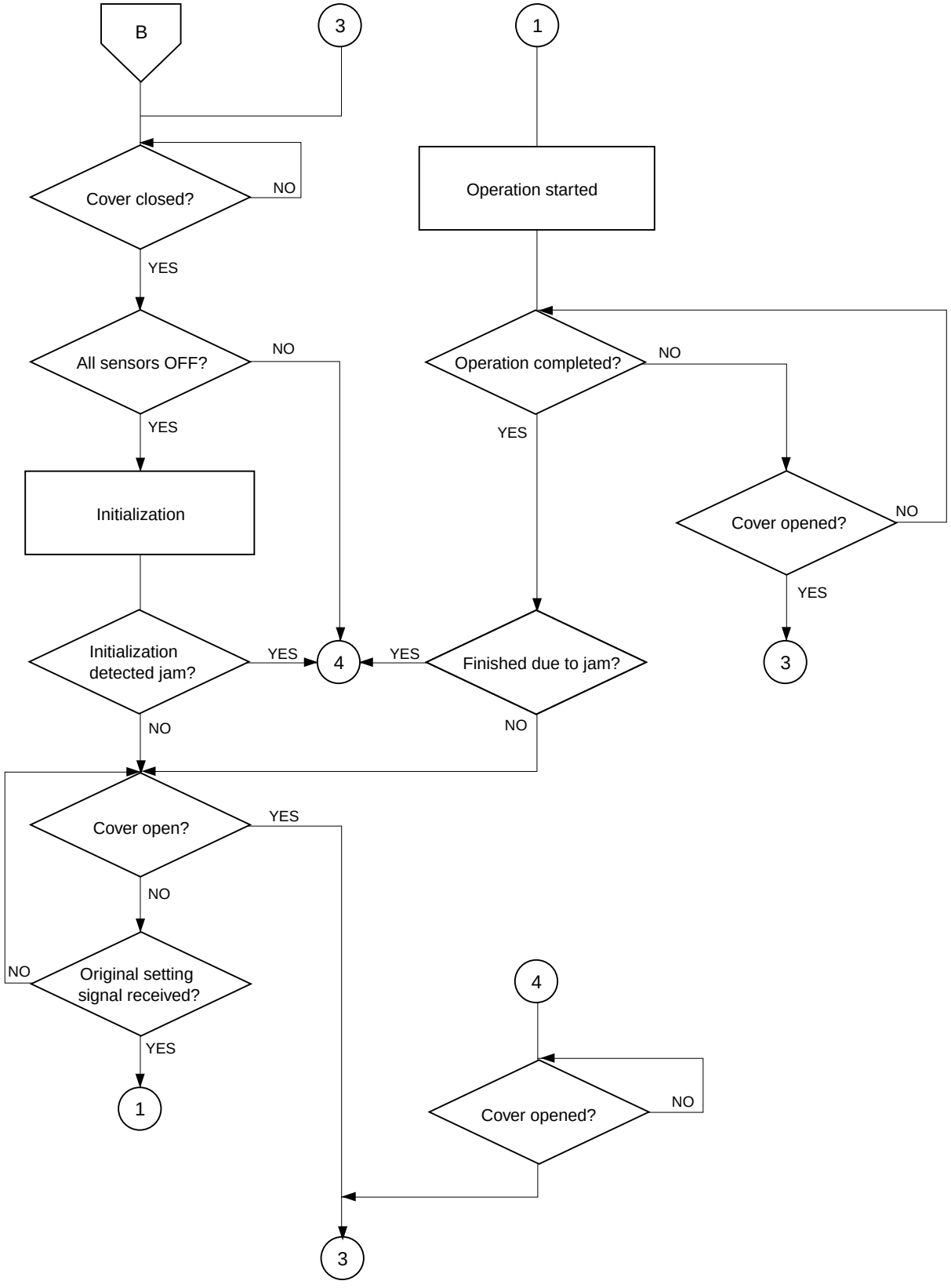
(1) Power ON → Start of communication line



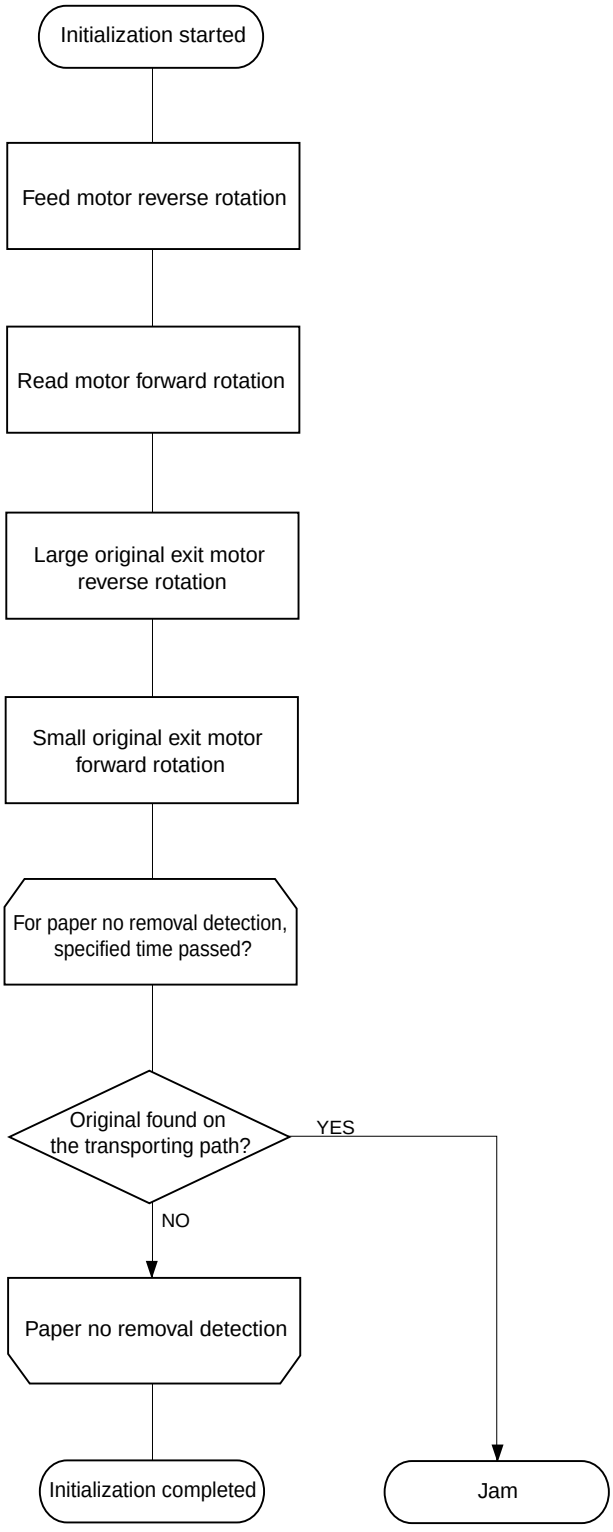
(2) Rewriting of flash ROM



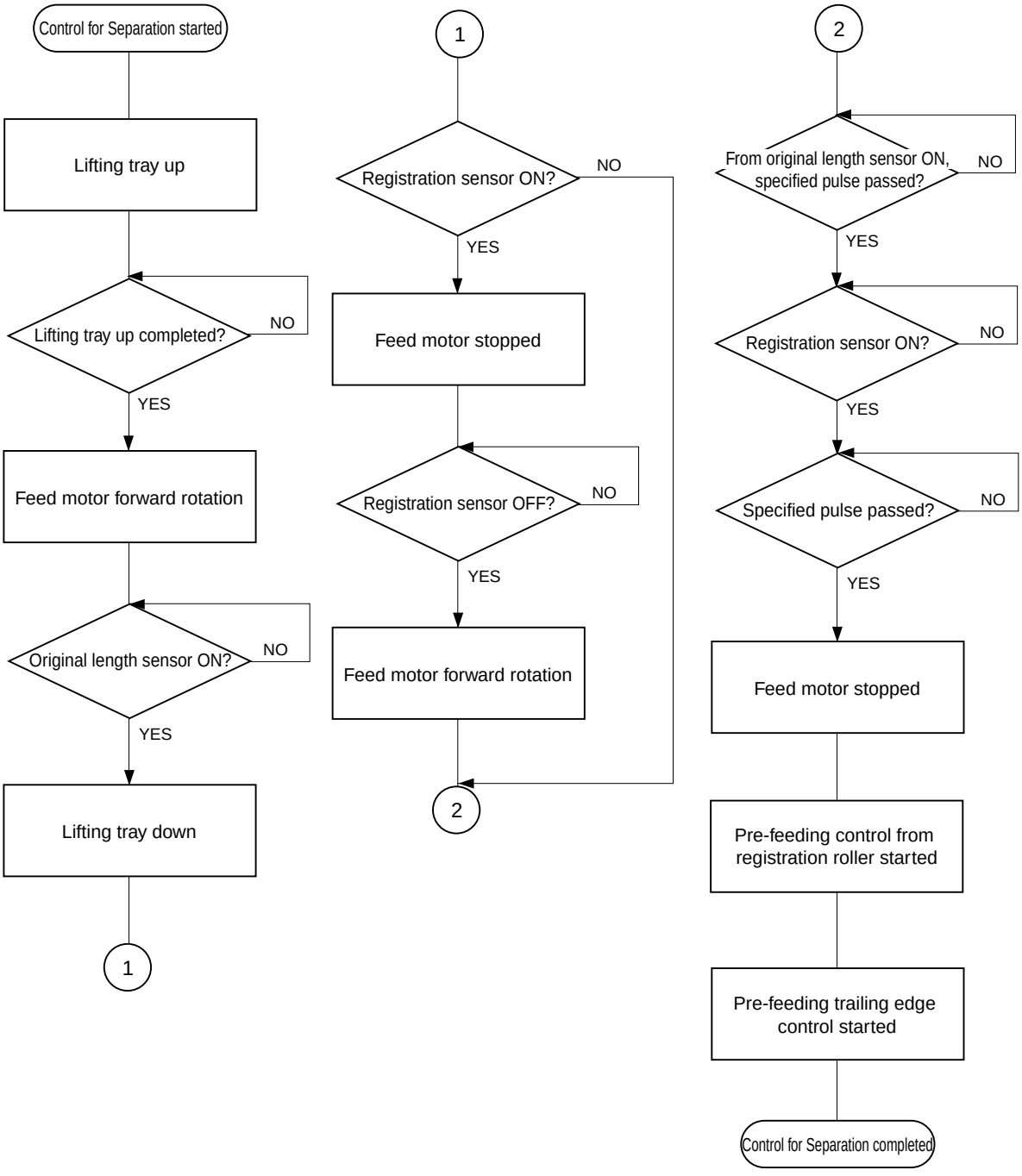
(3) Start of communication line → Operation monitoring



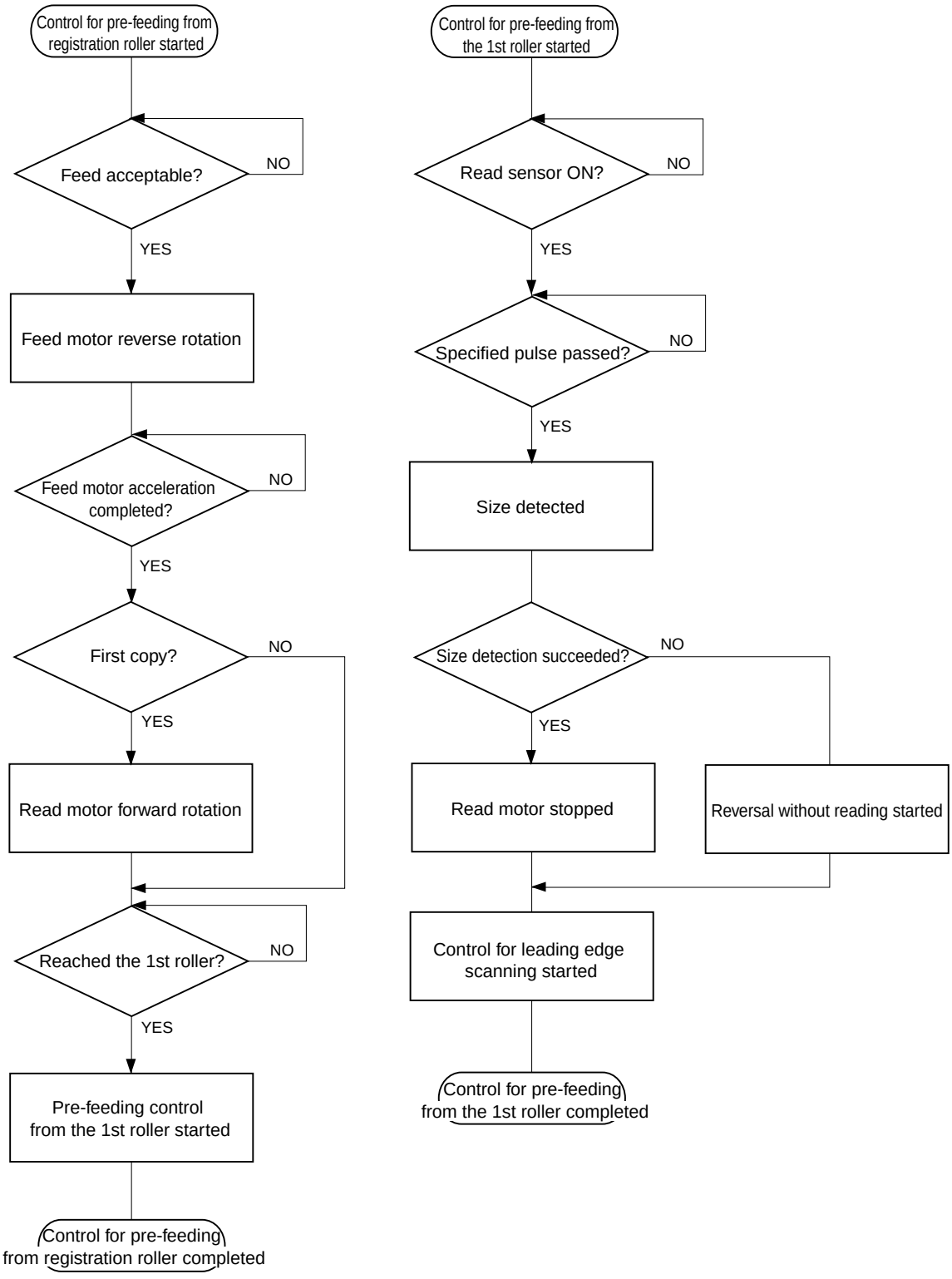
(4) Initialization



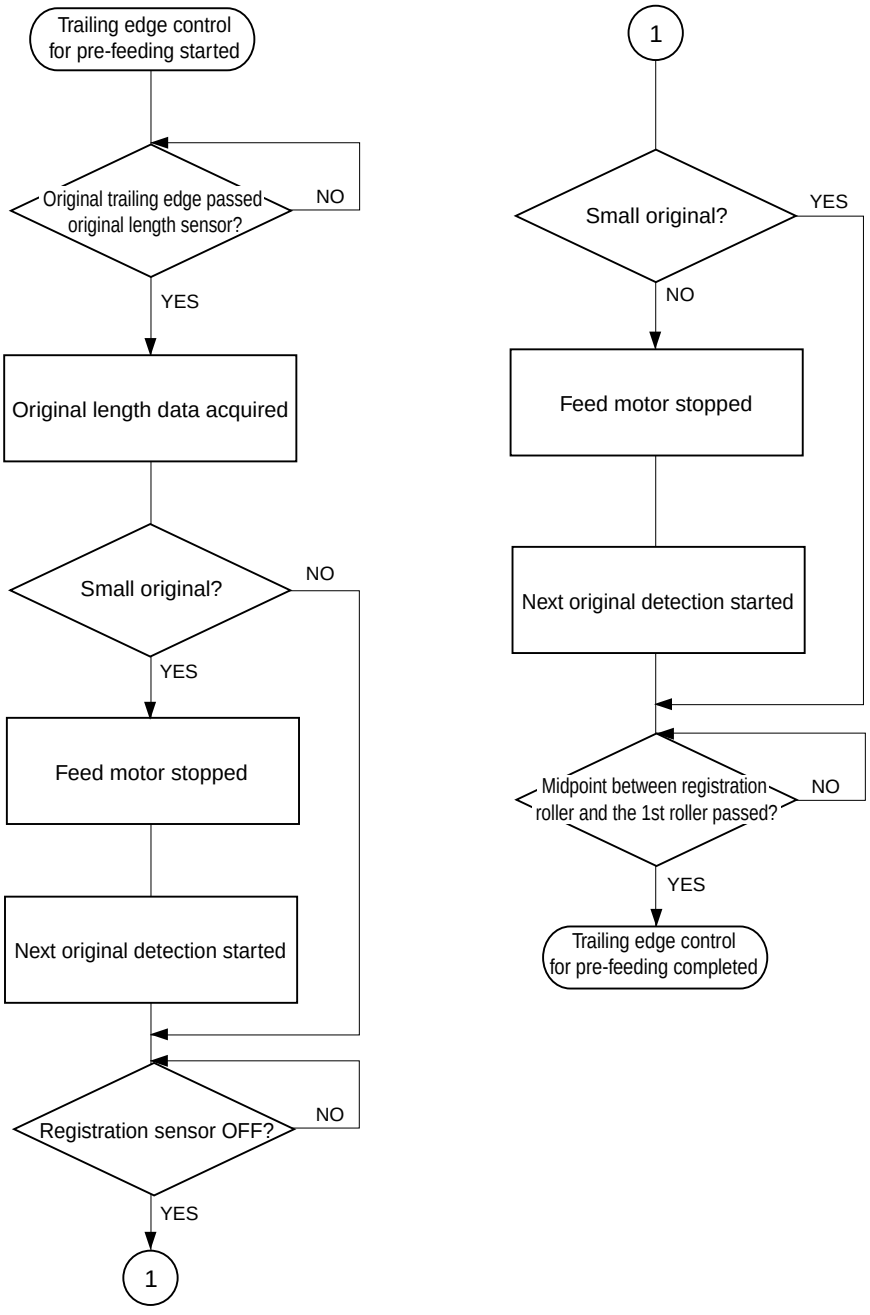
(5) Control for separation



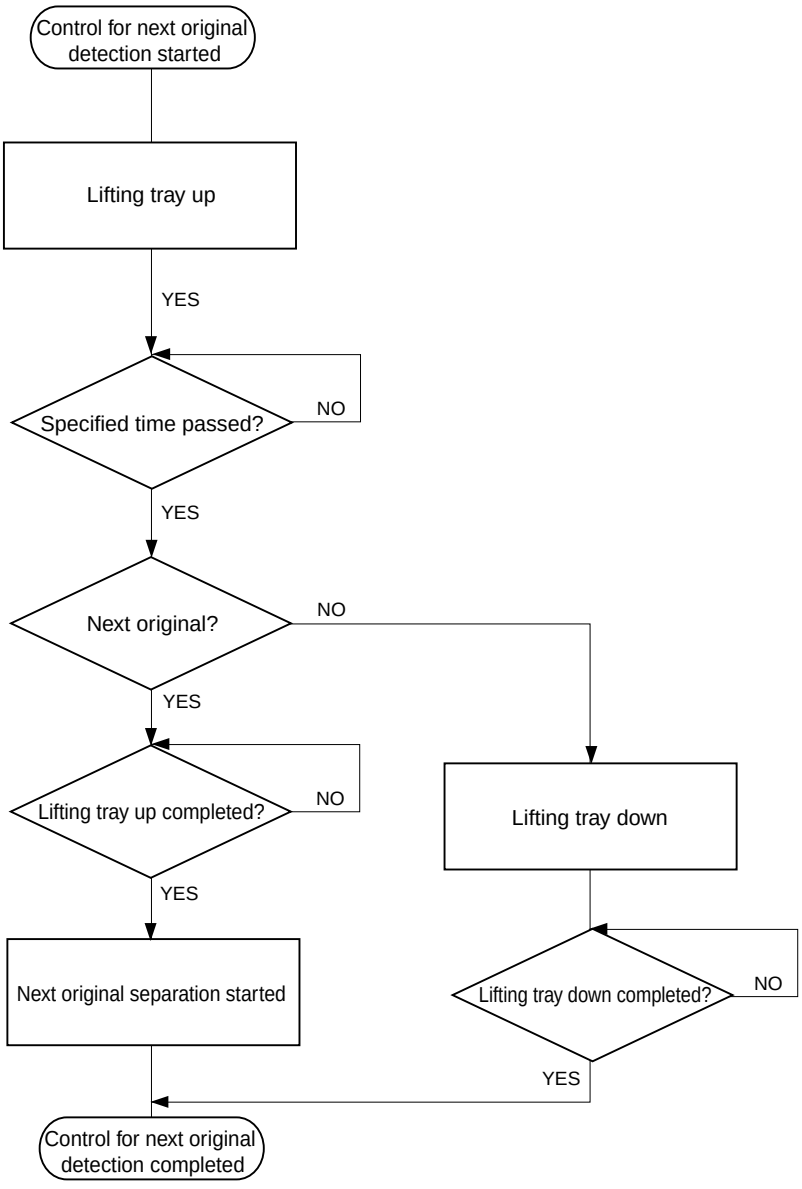
(6) Control for pre-feeding from registration roller



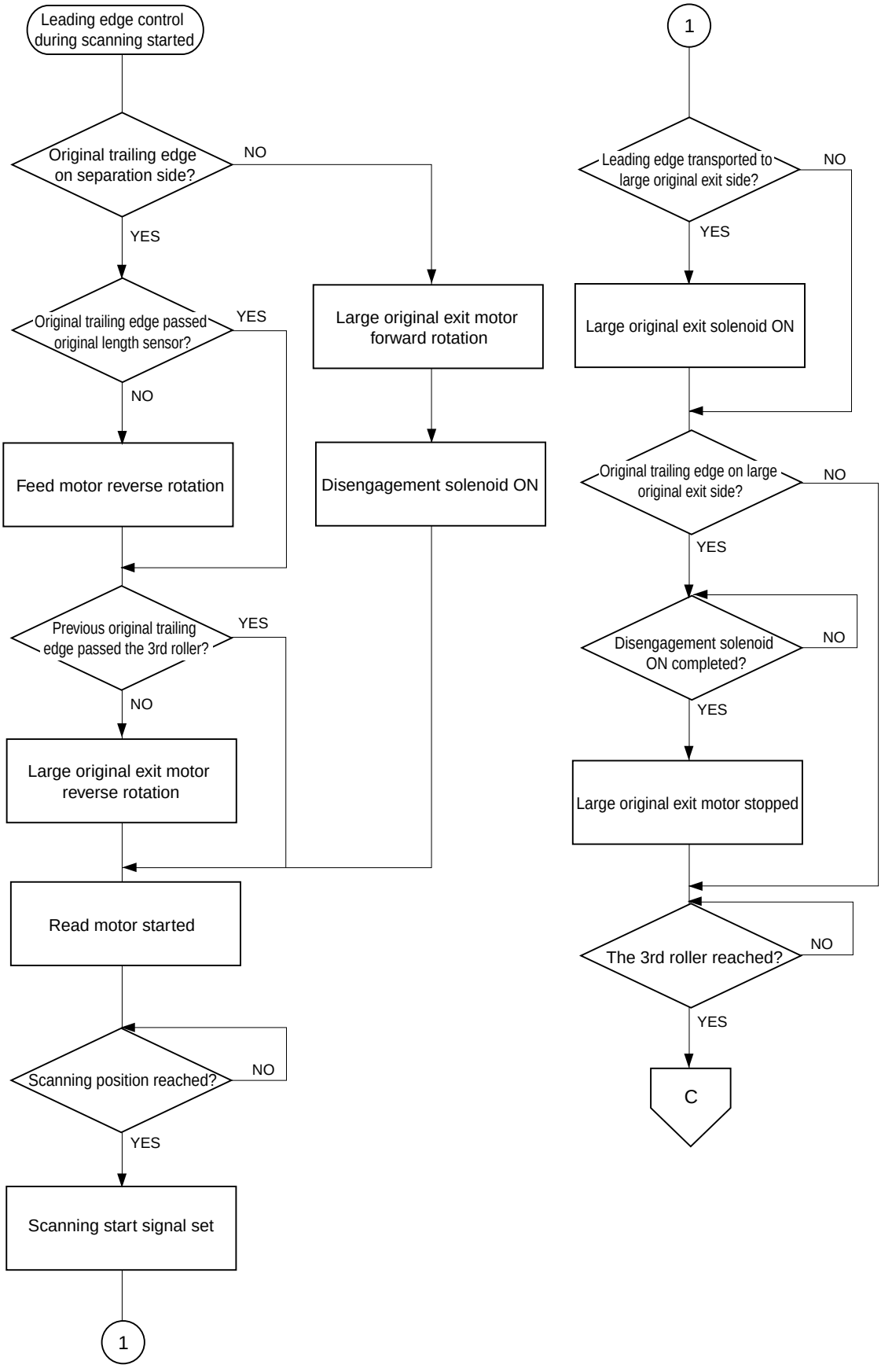
(7) Trailing edge control for pre-feeding

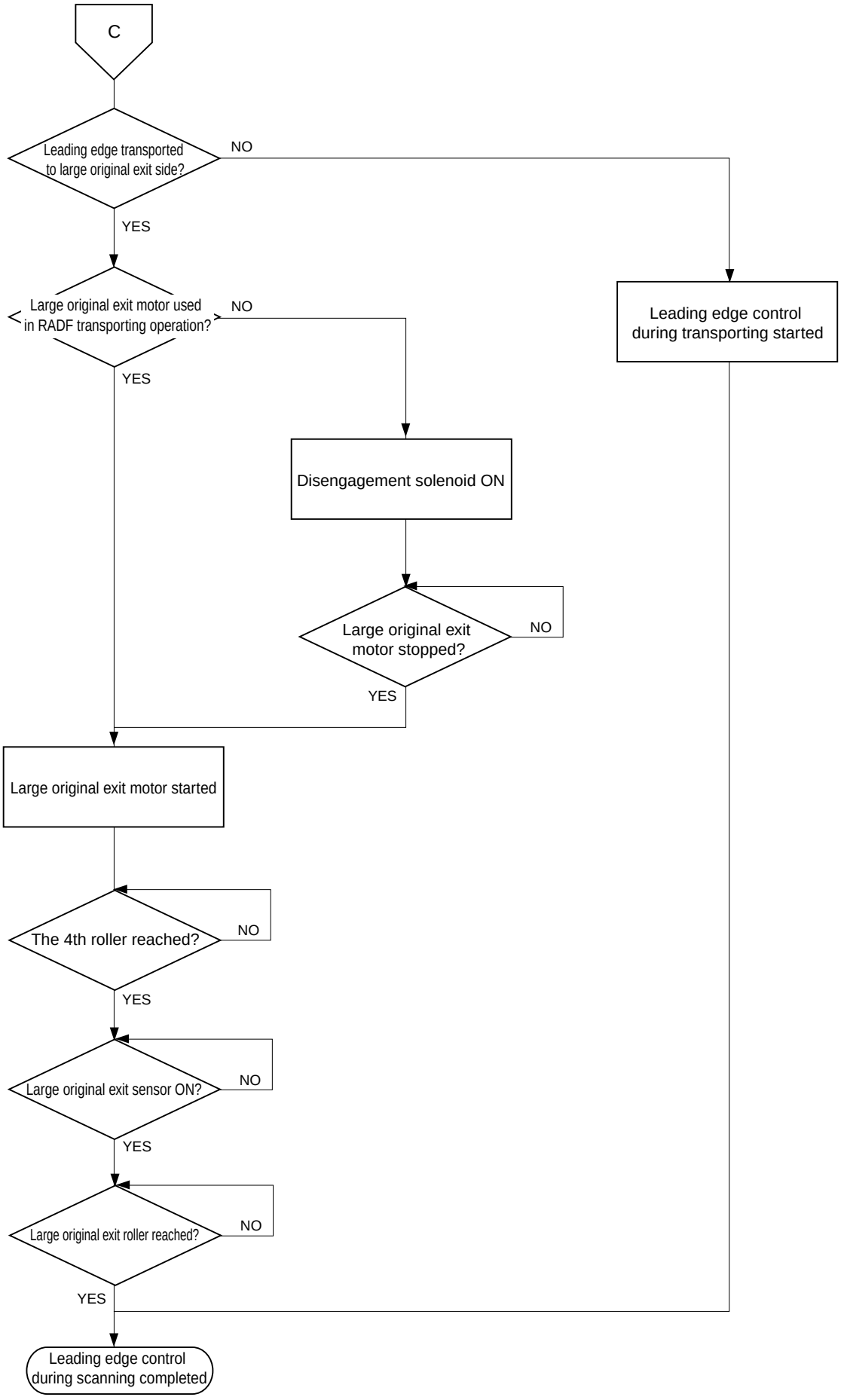


(8) Control for next original detection

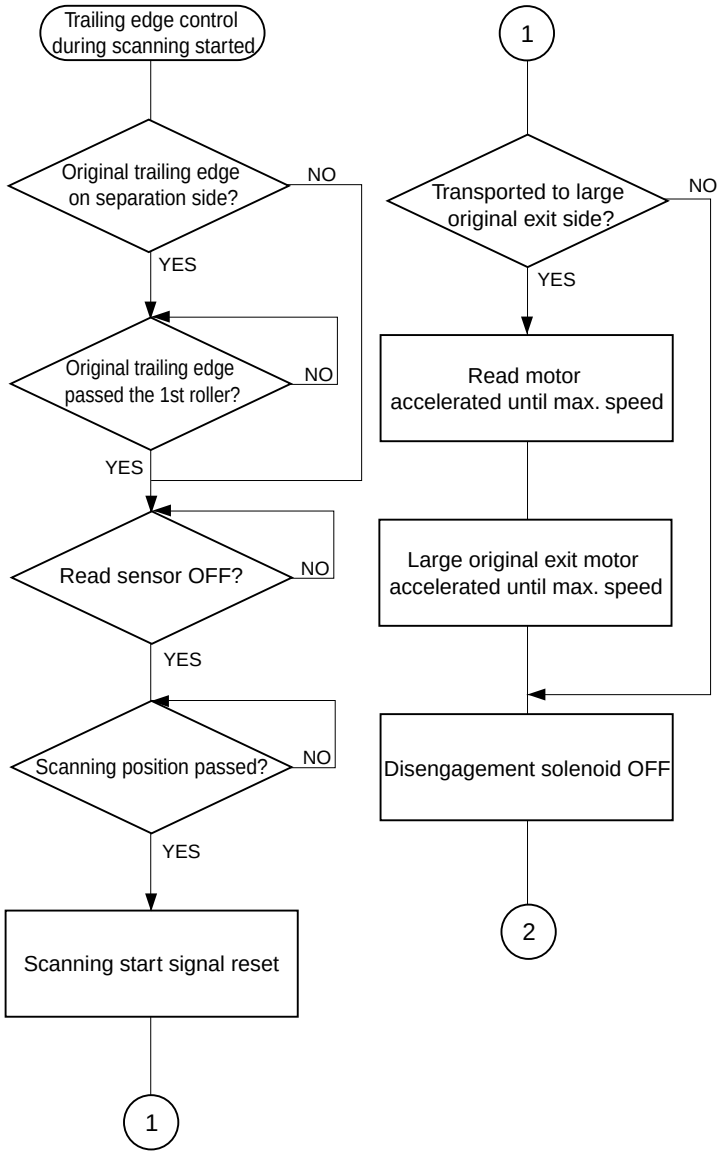


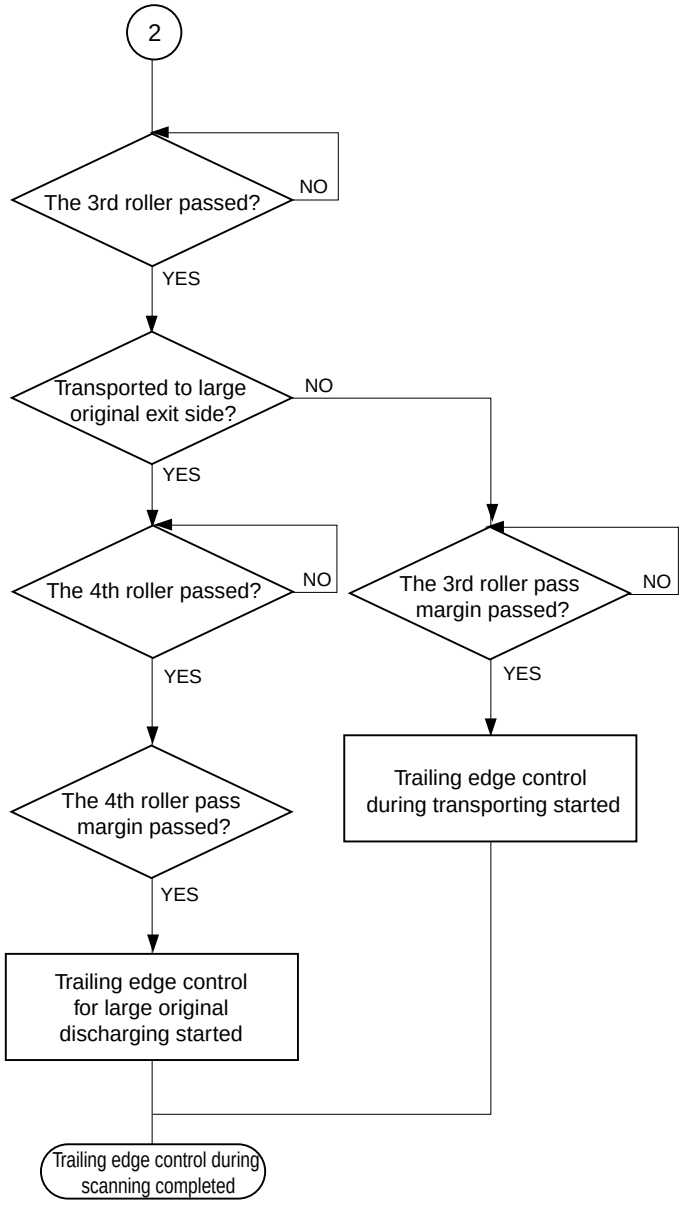
(9) Leading edge control during scanning



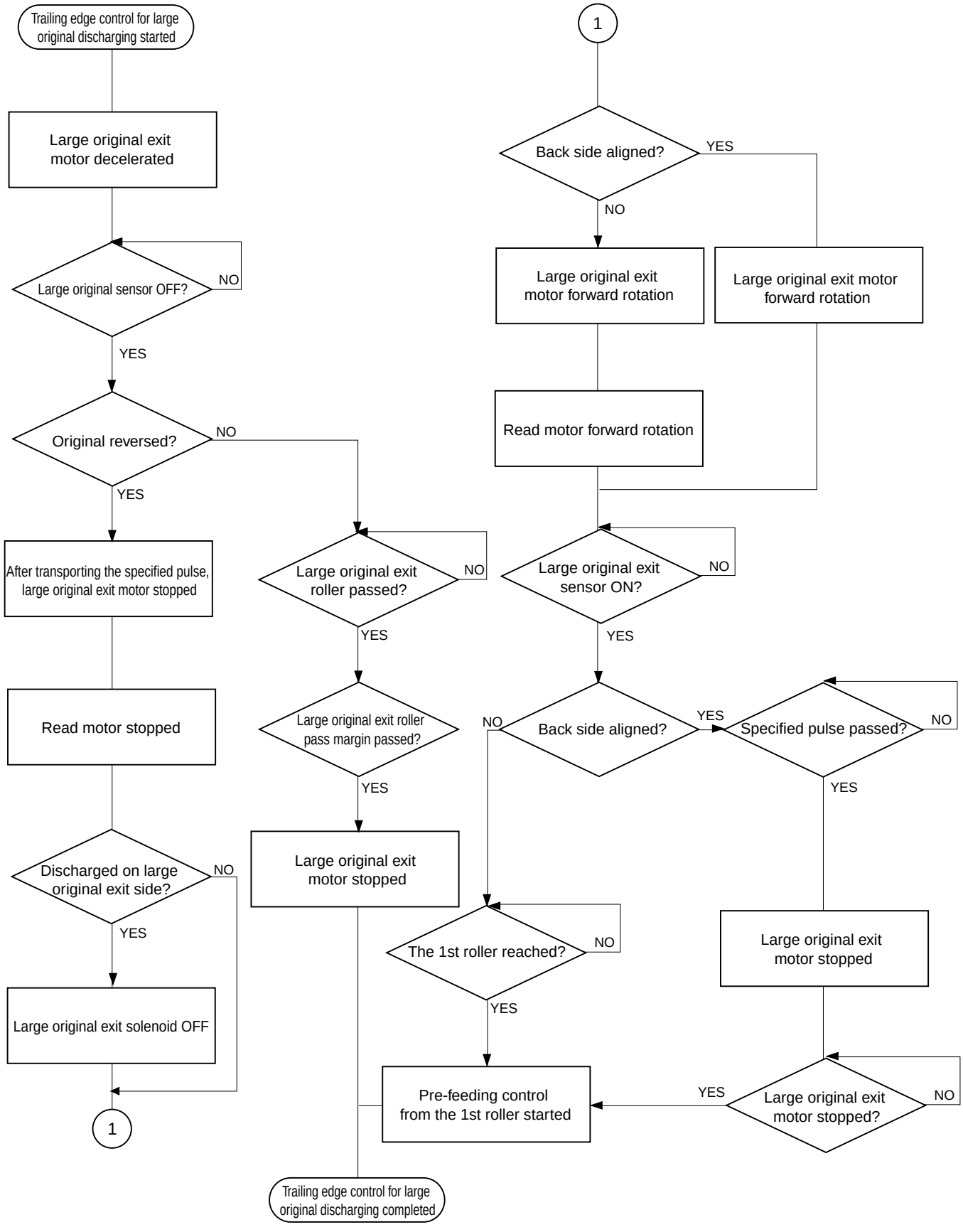

C
Leading edge transported to large original exit side?
NO
YES
Large original exit motor used in RADF transporting operation?
NO
YES
Leading edge control during transporting started
Disengagement solenoid ON
Large original exit motor stopped?
NO
YES
Large original exit motor started
The 4th roller reached?
NO
YES
Large original exit sensor ON?
NO
YES
Large original exit roller reached?
NO
YES
Leading edge control during scanning completed

(10) Trailing edge control during scanning

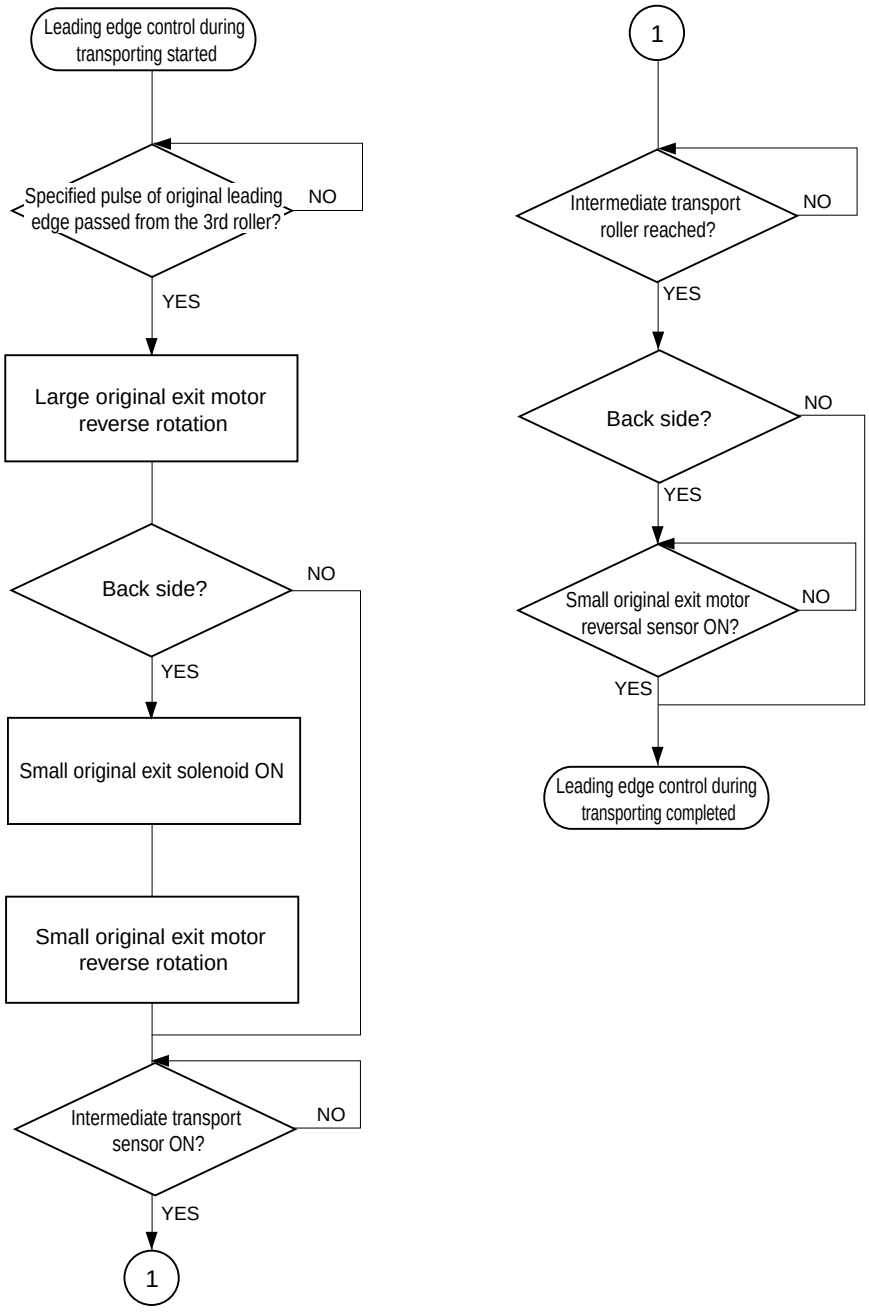



2
The 3rd roller passed?
NO
YES
Transported to large original exit side?
NO
YES
The 4th roller passed?
NO
YES
The 3rd roller pass margin passed?
NO
YES
The 4th roller pass margin passed?
YES
Trailing edge control during transporting started
Trailing edge control for large original discharging started
Trailing edge control during scanning completed

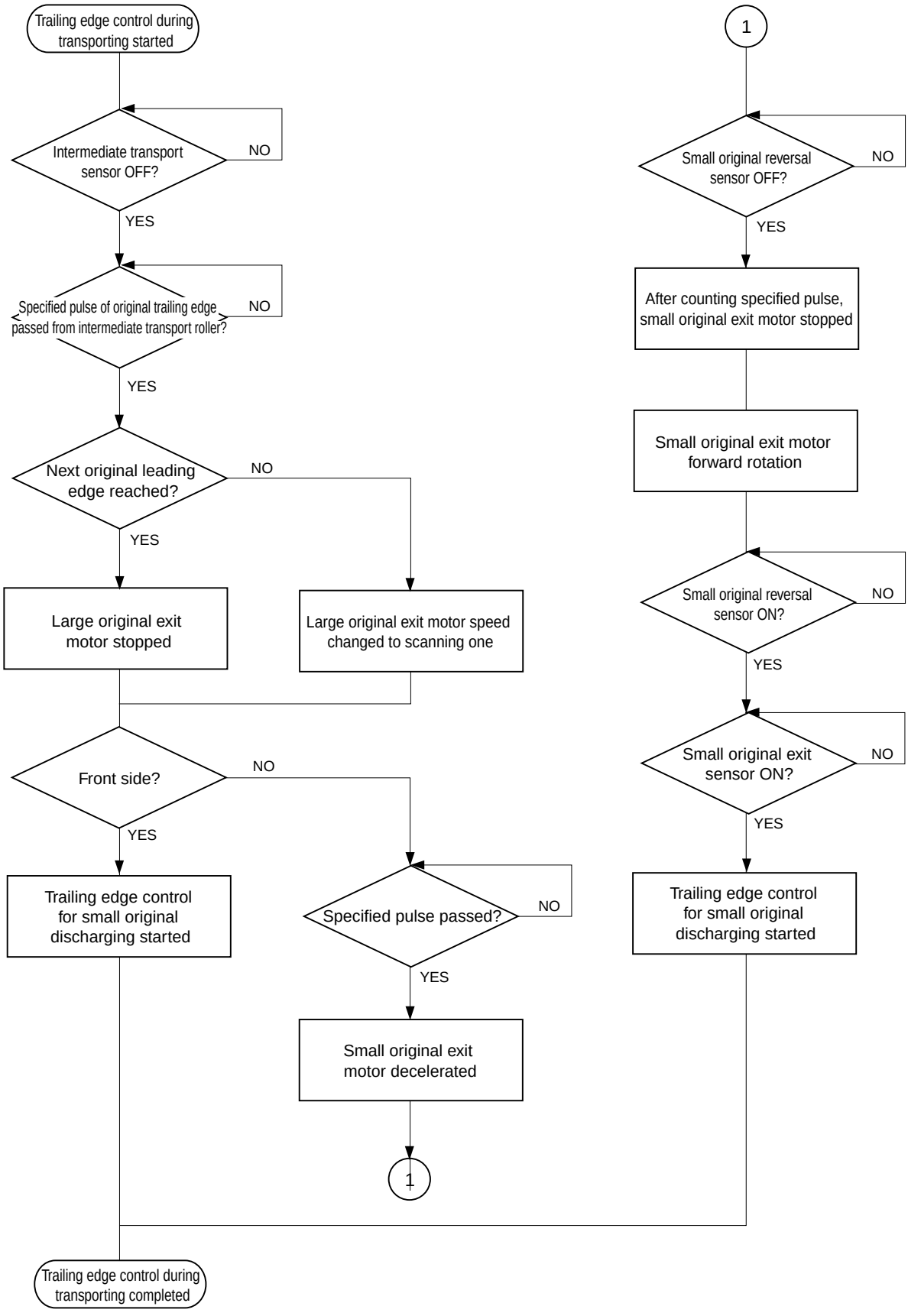
(11) Trailing edge Control for large original discharge



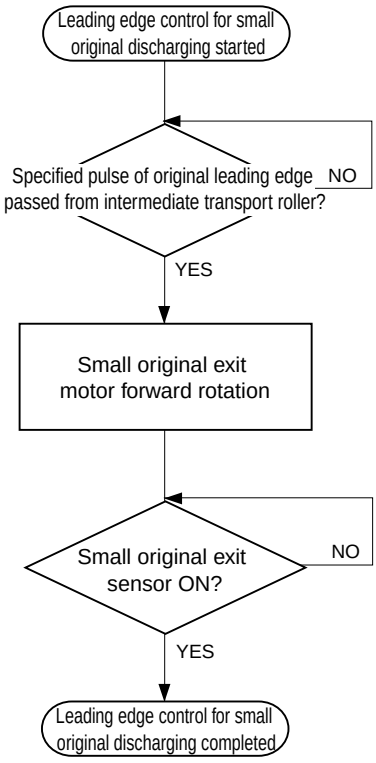
(12) Leading edge control during transporting

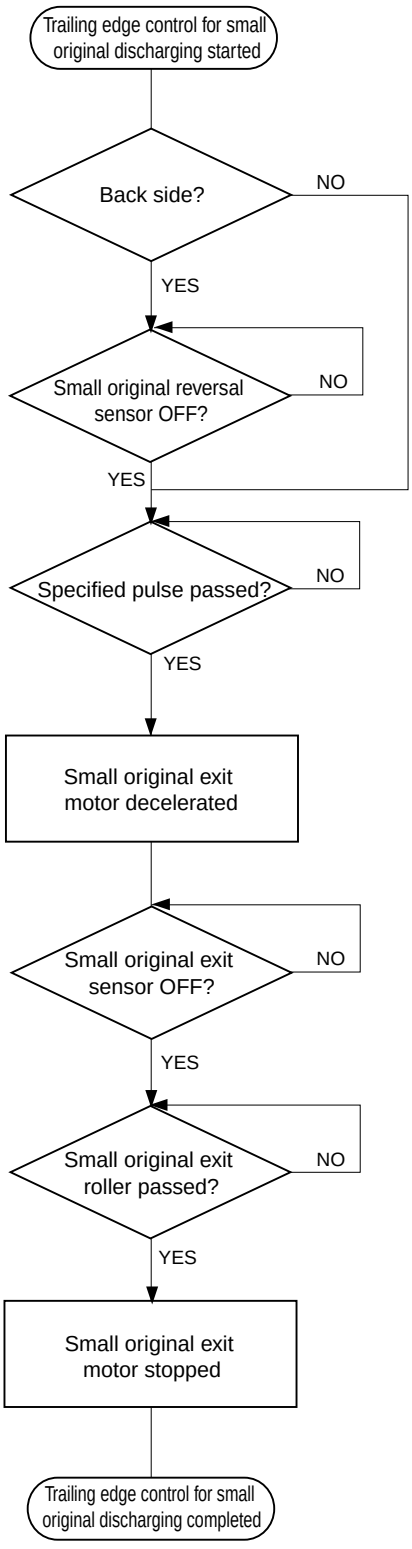


(13) Trailing edge control during transporting



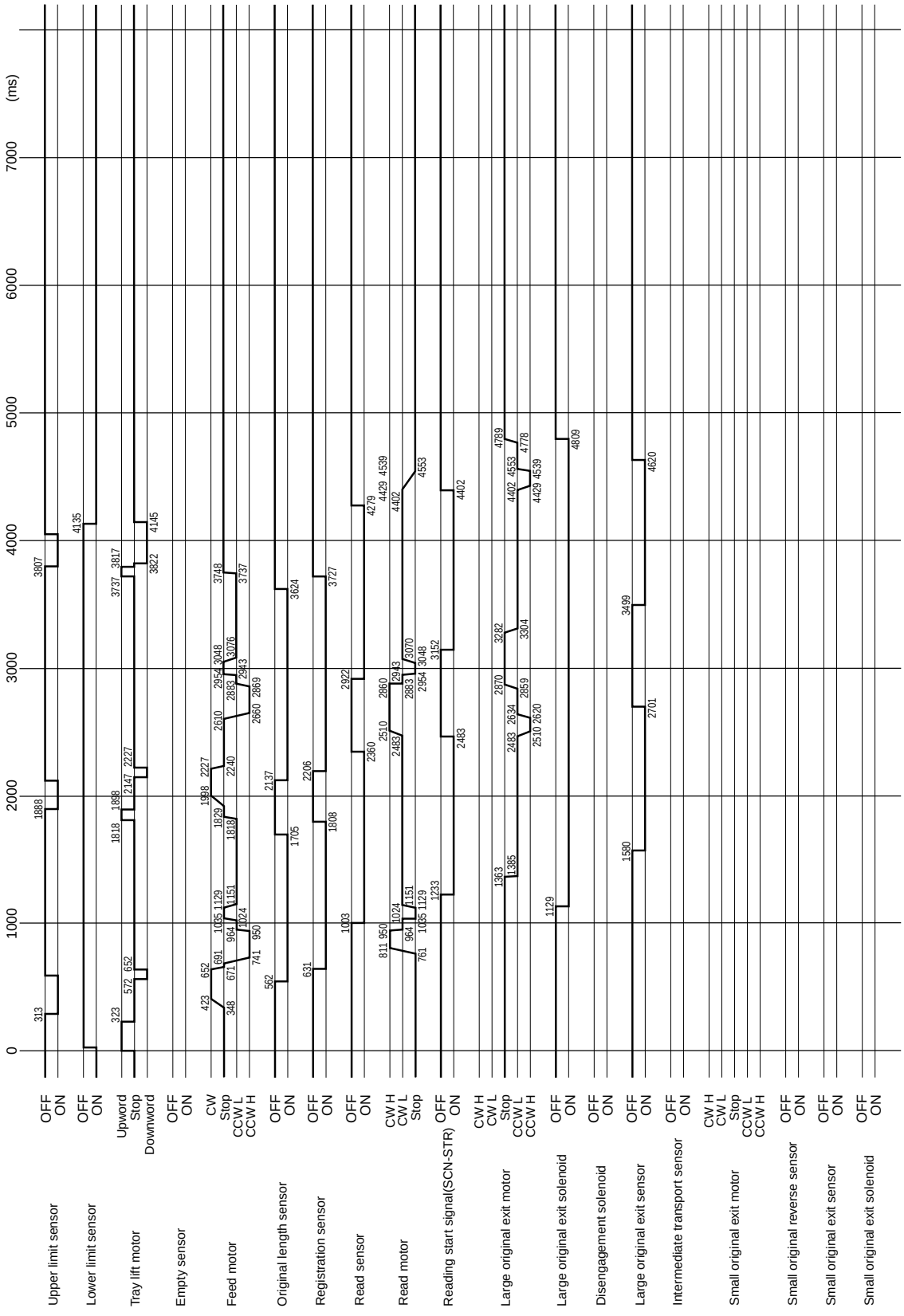
(14) Leading edge/trailing edge control for small original discharging


Leading edge control for small original discharging started
Specified pulse of original leading edge passed from intermediate transport roller?
NO
YES
Small original exit motor forward rotation
Small original exit sensor ON?
NO
YES
Leading edge control for small original discharging completed

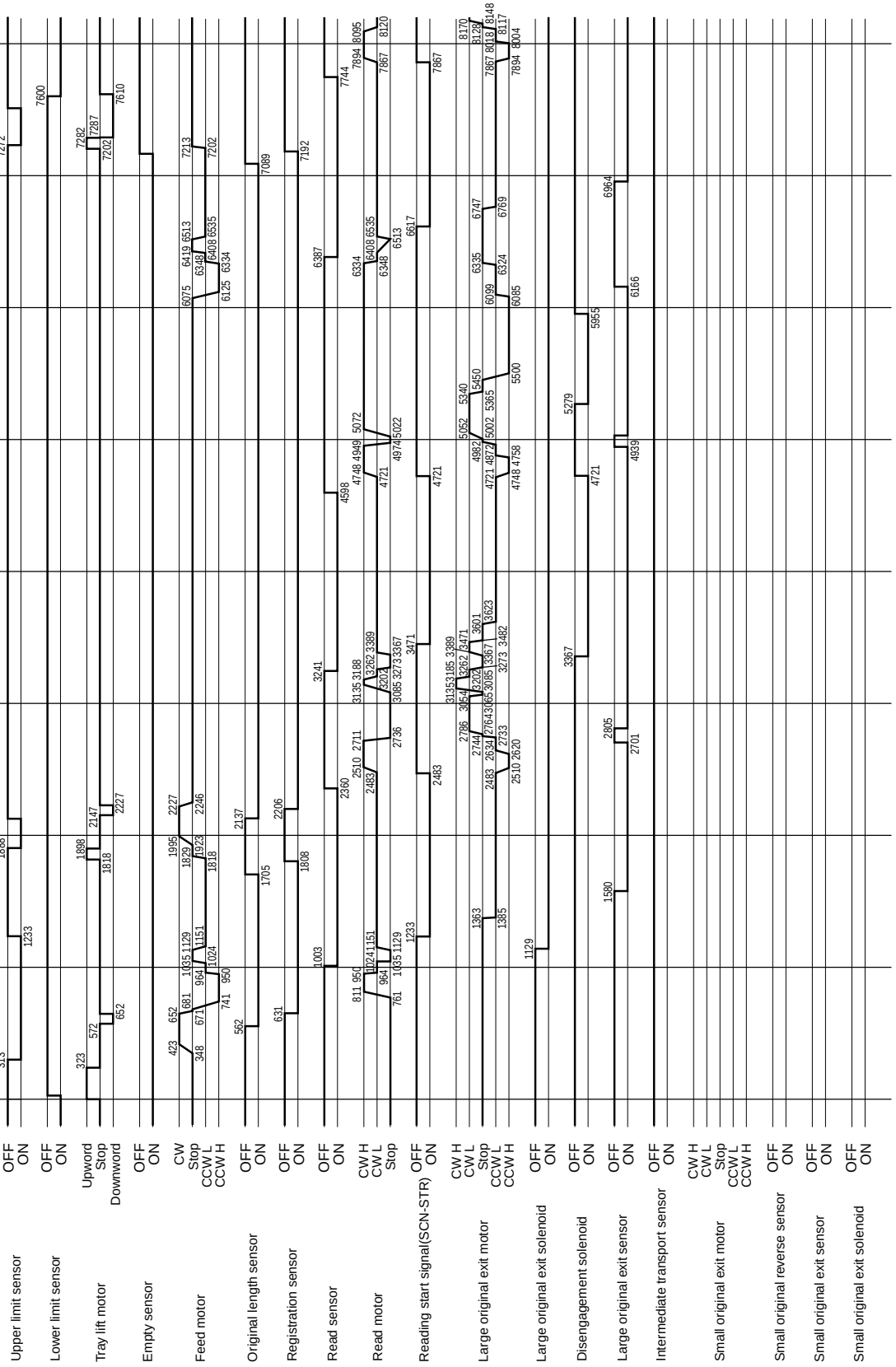


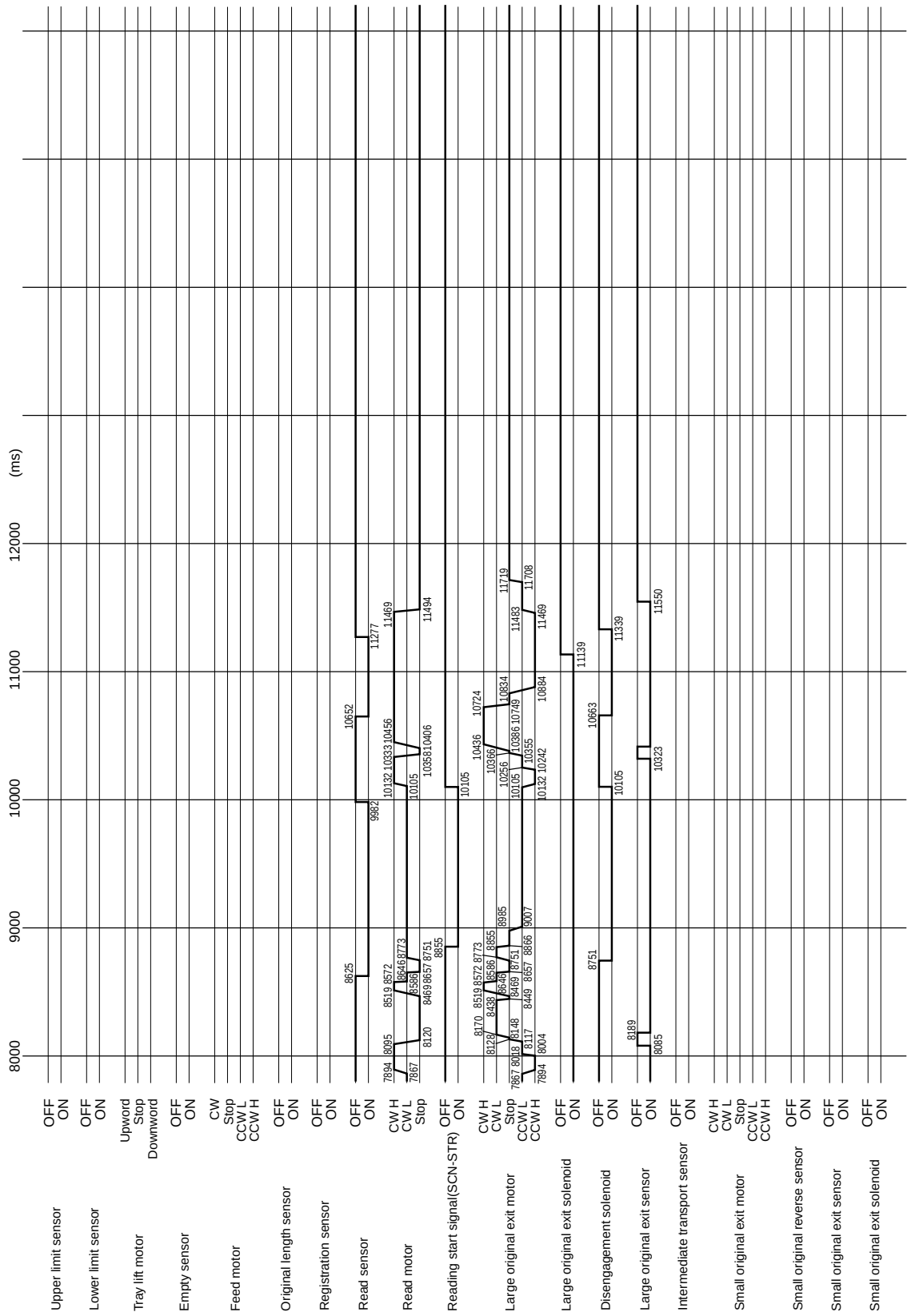
16. 10. Timing Chart

(a) Two sheets of A3 single-sided original

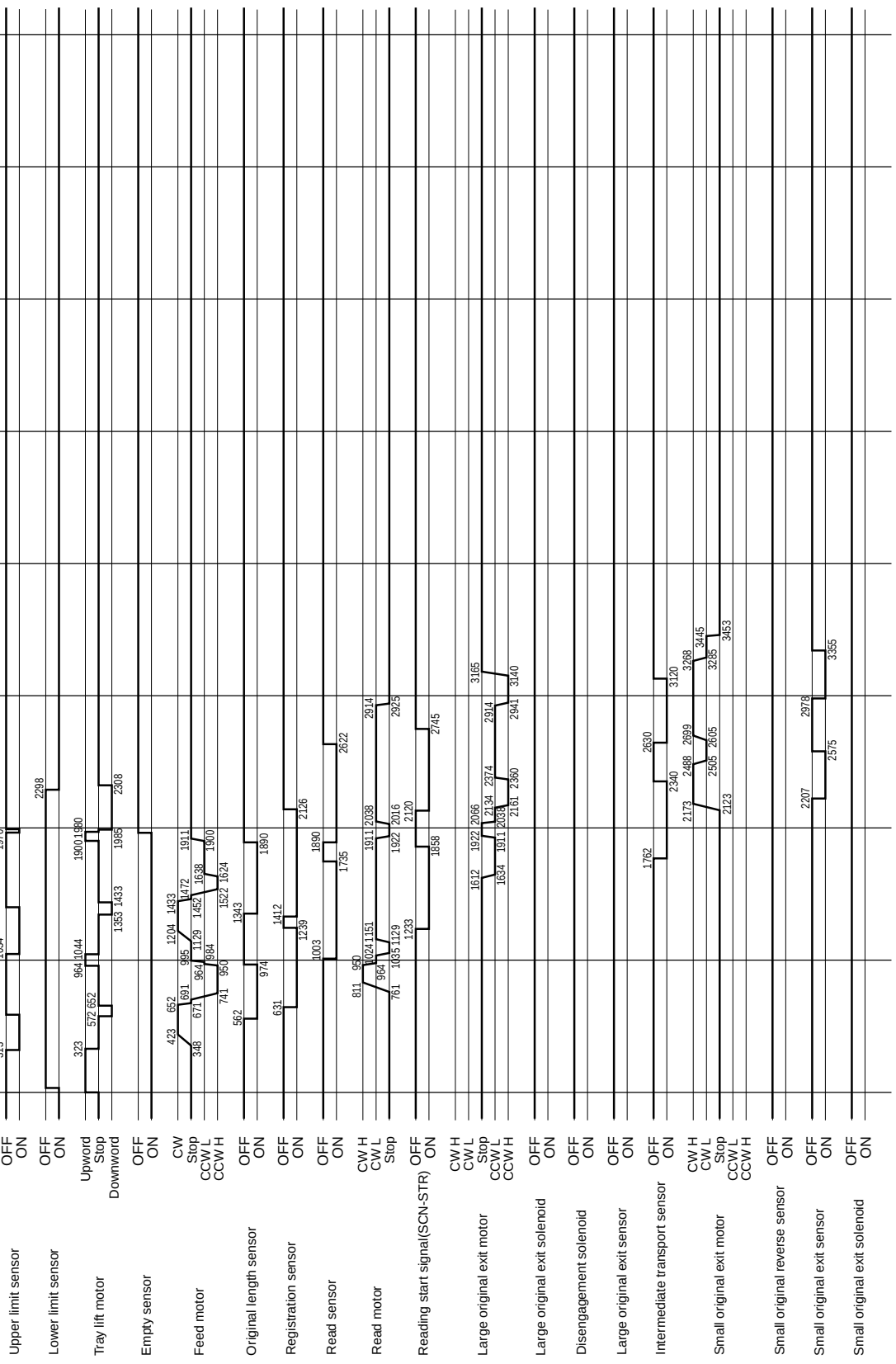


(b) Two sheets of A3 two-sided original

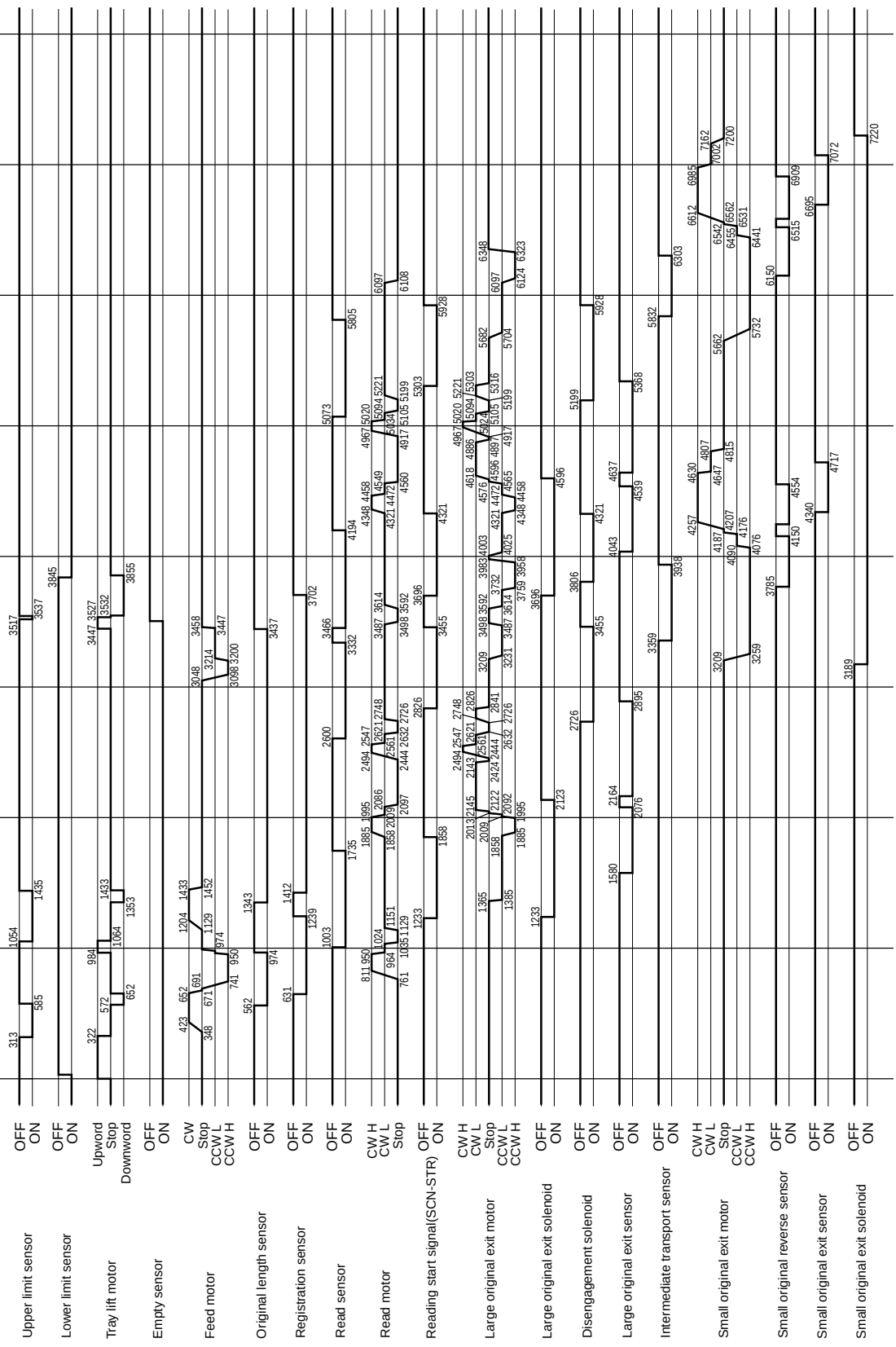



8000
9000
10000
11000
12000
(ms)
Upper limit sensor
OFF
ON
Lower limit sensor
OFF
ON
Tray lift motor
Upword
Stop
Downword
Empty sensor
OFF
ON
Feed motor
CW
Stop
CCW L
CCW H
Original length sensor
OFF
ON
Registration sensor
OFF
ON
Read sensor
OFF
ON
Read motor
CW H
CW L
Stop
Reading start signal(SCN-STR)
OFF
ON
Large original exit motor
CW H
CW L
Stop
CCW L
CCW H
Large original exit solenoid
OFF
ON
Disengagement solenoid
OFF
ON
Large original exit sensor
OFF
ON
Intermediate transport sensor
OFF
ON
Small original exit motor
CW H
CW L
Stop
CCW L
CCW H
Small original reverse sensor
OFF
ON
Small original exit sensor
OFF
ON
Small original exit solenoid
OFF
ON

(c) Two sheets of A4 single-sided original



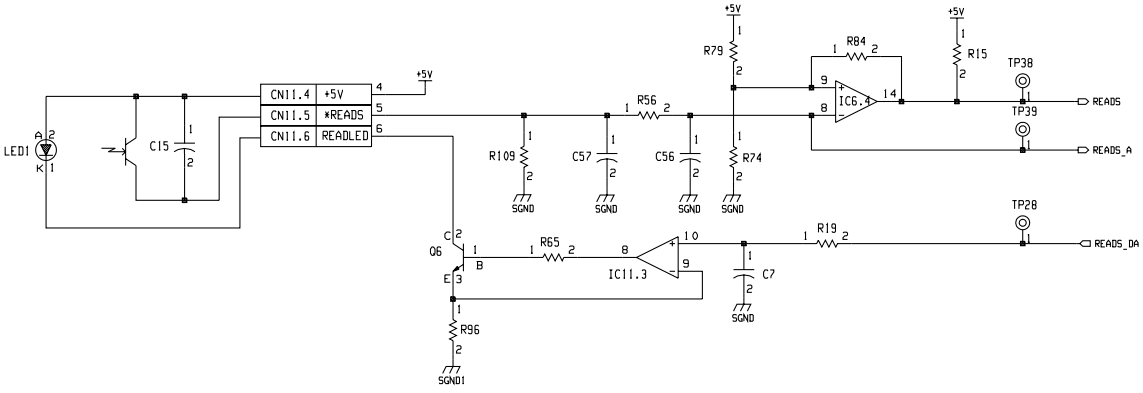
(d) Two sheets of A4 two-sided original



16. 11. Circuits

(1) Input circuits for read sensor, large original exit sensor, small original reverse sensor and original length sensor

Since the read sensor, large original exit sensor, small original reverse sensor and original length sensor have almost the same circuitries, only the input circuit for the read sensor is described as followed.



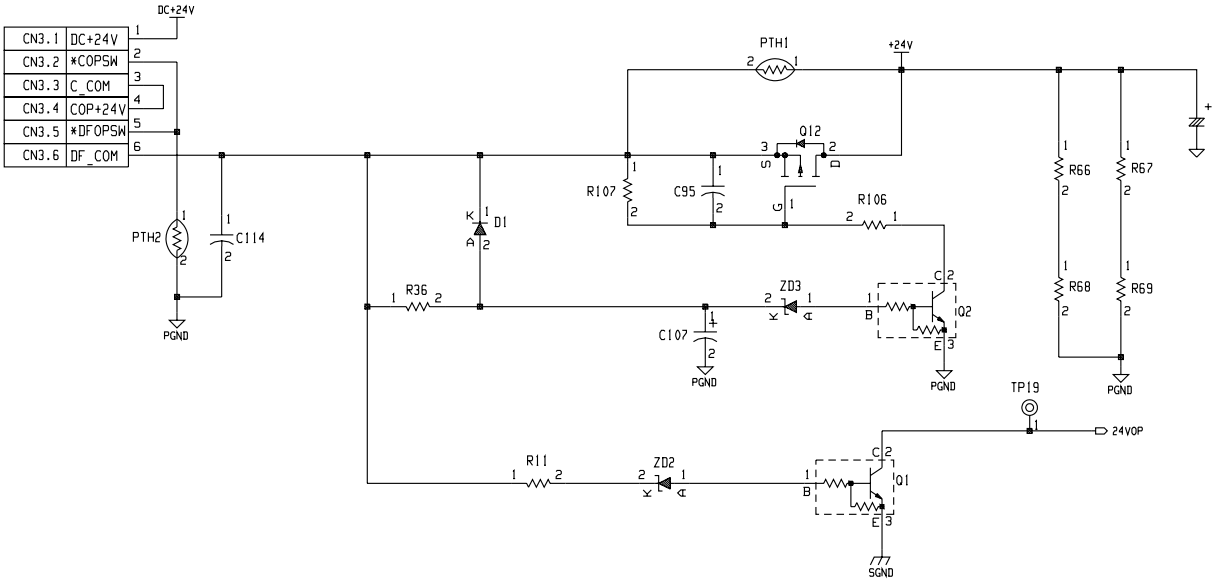
This circuit consists of the voltage-current conversion circuit, which adjusts the amount of light of the infrared LED, and the voltage comparison circuit, which compares the voltage output from a phototransistor (PTr) with a reference voltage and converts the output voltage into digital signals.

The read sensor is a mirror reflection sensor, and consists of a pair of emission elements (infrared LEDs) and a light receiving element (PTr). Both elements have a light axis running in the same direction. There is a mirror on the extended light axis of these elements. When there is no original between the elements and the mirror, infrared light emitted from LED is reflected by PTr in high reflectance. If there is an original, light emission to the mirror and reflected light from the mirror are blocked by the original, and the reflected light entering PTr becomes extremely small.

When a large amount of light is entering PTr (this means there is no original) the optical current flowing in the PTr is increased, and the voltage of IC6-8pin becomes higher due to a drop in voltage caused by R109. IC6 is a comparator which compares the reference voltage input to 9pin (non-reverse input terminal) with the signal voltage of 8pin (reverse input terminal). If the voltage of 8pin is higher, the output level (IC6-14pin) is "L". On the contrary, when the amount of the incoming light is small (this means there is an original), the voltage of 14pin is low and the voltage of IC6-14pin becomes "H". R56, C56 and C57 are noise filters. This circuit has an automatic sensitivity adjustment function to control the unevenness of the sensor sensitivity. Uneven sensor sensitivity is corrected by controlling the machine to have a constant PTr voltage when there is no original. The intensity of the infrared light emitted from the LEDs is changed to adjust the PTr voltage.

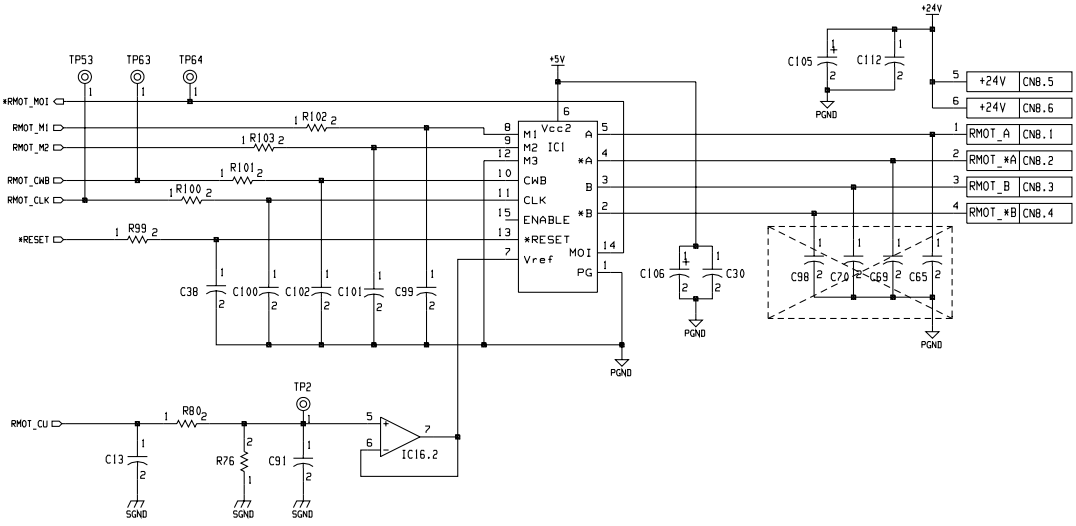
When the sensor sensitivity adjustment mode is selected, the PTr output voltage (analog value) is measured by the A-D input terminals of CPU. The output voltage of the D-A converter is changed to keep the PTr output voltage to a certain level, and the LED current is adjusted by a voltage-current conversion circuit consisting of IC11, R65, Q6, etc. Each machine; has a different D-A output voltage value, which is stored in the volatile memory.

(2) Irruptive current control circuit



This circuit controls the irruptive current flowing into the current regeneration condensers mounted on the drive circuits for the motors to a certain value. The circuit consists of a posister (PTH1) which controls the current and FET (Q12) which supplies the current in normal conditions.
Base current is not supplied to Q2 and it becomes OFF after the RADF open/close switch and cover open/close switch are turned OFF till the cathode voltage of ZD3 reaches the zener voltage. At this time, both voltages are set by R36 and C107. Q12 is turned OFF correspondingly to supply the current to PTH1, and the current regeneration condensers are charged.
After the current regenerarion condensers are fully charged and when the cathode voltage of ZD3 exceeds the zener voltage after the time allowance given by C107 and R36, a base current is supplied to Q2 to turn it ON and Q12 comes ON correspondingly. The current limitation is canceled and the current flowing in the PTH1 starts to be supplied to Q12.
R66, R67, R68 and R69 are discharge resistors to capture charge stored in the current regeneration condensers right after either of the RADF open/close switch or cover open/close switch is opened. The circuit consisted of PTH2 and D1 captures the charge stored in C107 right after either the RADF open/close switch or the cover open/close switch is opened, and also controls incoming current for instantaneous opening/closing of the cover.

(3) Drive circuit for read motor

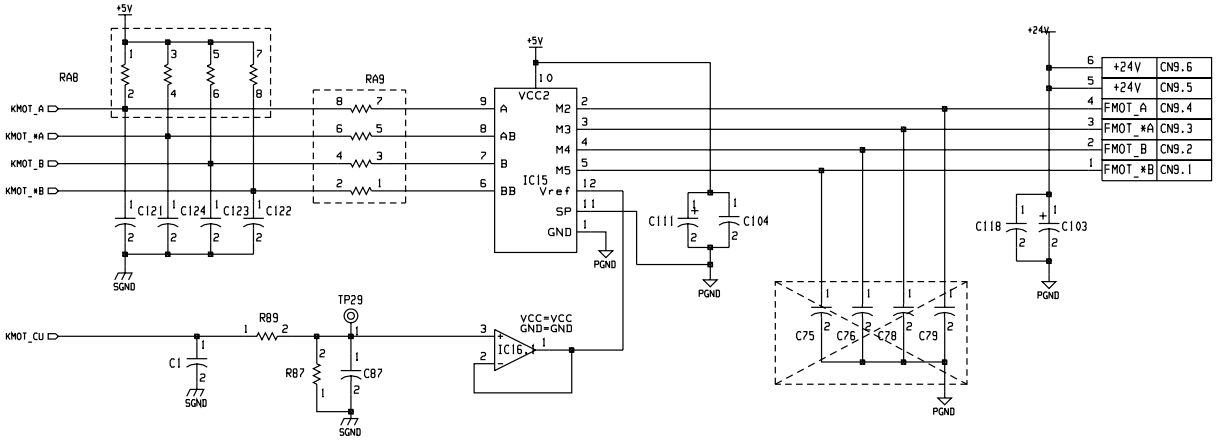


This circuit controls the rotation/stoppage and the direction of rotation, excitation mode and motor current of the read motor.

A drive clock signal (RMOT_CLK) and rotation direction signal (CWB) are input to control the speed and direction of the motor rotation. M1 and M2 are the exciting mode setting signals.

The PWM signal of RMOT_CU is separated and smoothed at R80, R76 and C91, and it is input into IC10-7pin(Vref) to set the motor current value. The motor current value can be changed by altering duties of the PWM signal.

(4) Drive circuit for feed motor

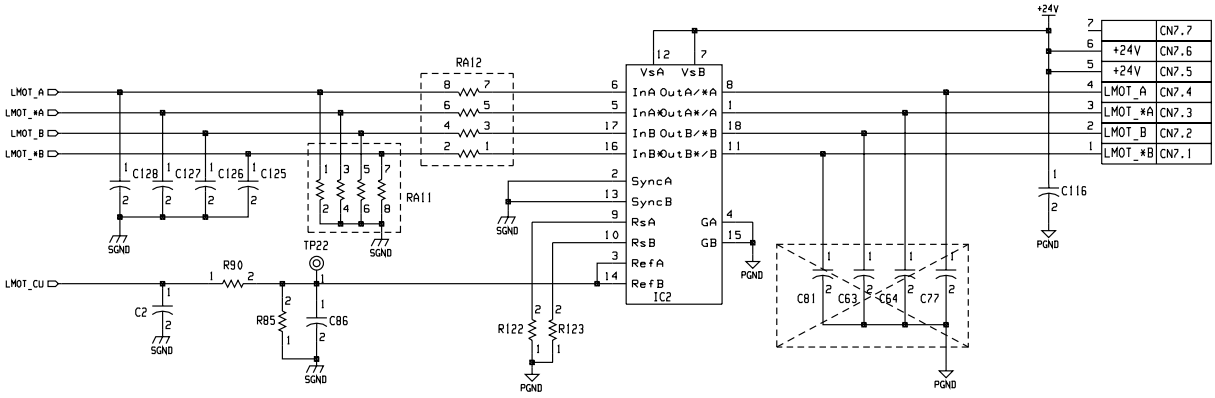


This circuit controls the rotation/stoppage, the direction of the rotation of the feed motor and the motor current. The drive pattern signal is input into IC15-6, 7, 8, 9 to control the speed and direction of the motor rotation.

The PWM signal is input into FMOT_CU and separated and smoothed at R89, R87 and C87, and it is input into IC15-12pin (Vref) to set the motor current value. The motor current value can be changed by altering duties of the PWM signal.

(5) Drive circuit for large original exit motor, small original exit motor and tray lift motor

Since the large original exit motor, small original exit motor and tray lift motor have almost the same circuitries, the drive circuits for the small original exit motor and tray lift motor are not described. The following is the drive circuit for the large original exit motor.



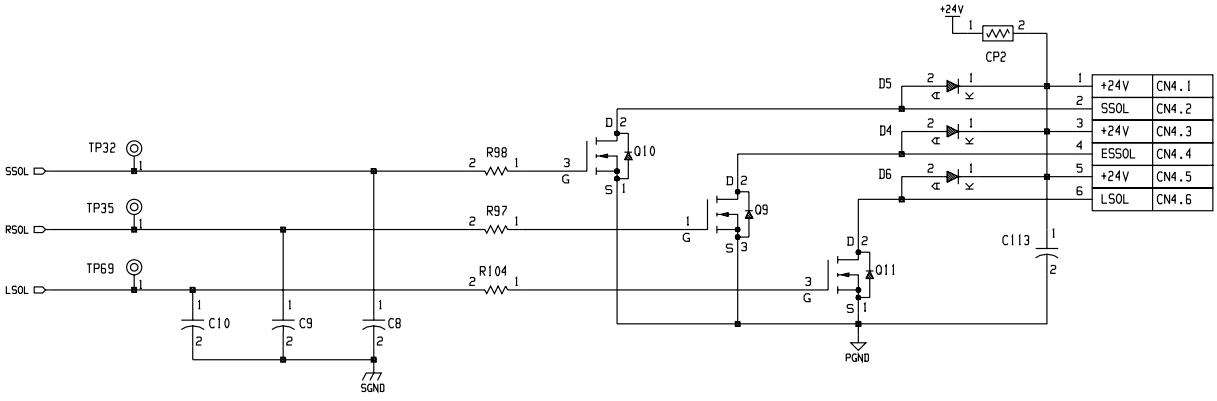
This circuit controls the rotation/stoppage, the direction of the rotation of the large original exit motor and the motor circuit. The drive pattern signal is input into IC2-5, 6, 16, 17pin to control the speed and direction of the motor rotation.

The PWM signal is input into LMOT_CU and separated and smoothed at R90, R85 and C86, and it is input into IC2-3pin(RefA) and14pin(RefB) to set the motor current value. The motor current value can be changed by altering duties of the PWM signal.

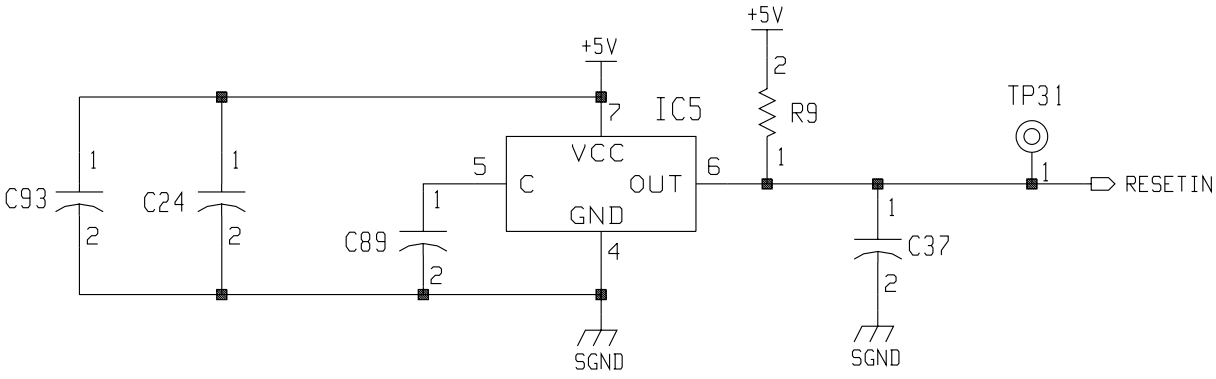
(6) Drive circuit for disengagement solenoid, small original exit solenoid and large original exit solenoid

This circuit controls the closing/opening of the flappers of the disengagement, small original exit and large original exit solenoids.

When the level of ESSOL, SSOL, LSOL is “H”, Q9, Q10, Q11 are turned ON and the flappers are closed. The drive signal for the disengagement solenoid is a PWM signal. The flappers are closed in the maximum torque of the solenoids and the duty value becomes 100% when the flappers start to be closed. After finishing closing, the duty value is decreased down to 50% and the flappers are kept closed while the temperature rise of the solenoids is being lowered.

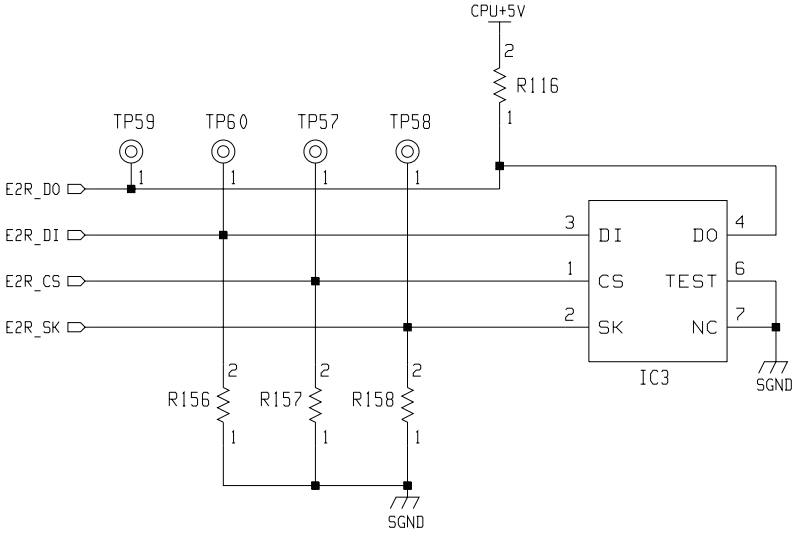


(7) Reset circuit



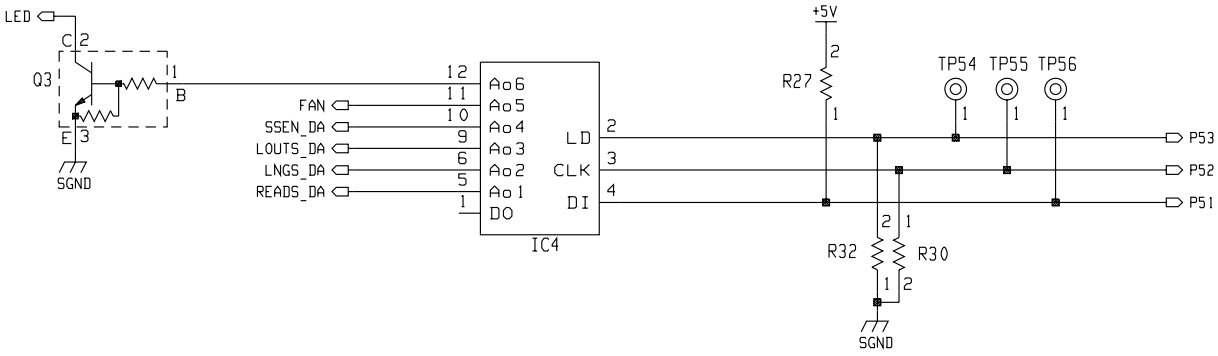
This circuit generates a CPU reset signal when the power is turned ON and the power voltage is detected to have become lower.
The level of IC5-6pin (OUT) is normally "H" after the power is turned ON. However, when the power is turned OFF or the voltage of the +5V power supply is decreased to 4.25V or lower for some reason, the level of IC5-6pin becomes "L" and the CPU is reset.

(8) EEPROM circuit



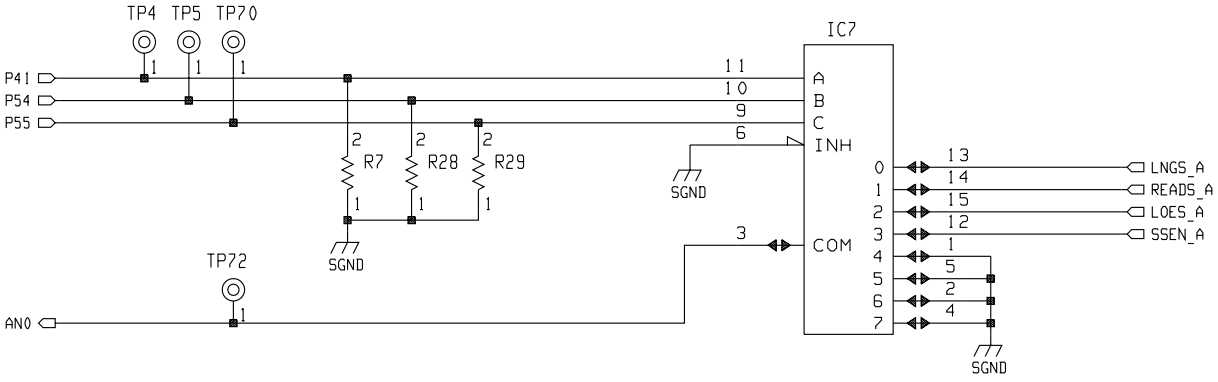
This circuit is an EEPROM to store ADF data and its peripheral circuit.
IC3 is a memory to store the adjustment value for reflection-type sensors, and data are sent/received between IC3 and CPU using a 4-line type serial interface. Data saved in the IC3 is not erased even if the power is turned OFF.
IC3-1pin (CS) is a chip selection terminal and its level is "H" when data are being sent/received.
IC3-2pin (SK) is a serial clock terminal, and the serial data are sent in synchronization with the clock input which is input to this terminal.
IC3-3pin (DI) is a input terminal for serial data and IC3-4pin (DO) is an output terminal for serial data.

(9) Conversion circuit for D-A



This is a circuit of the D-A converter to converse the digital signal from CPU to the analog signal. Controls of CPU are done by the serial communications of each DI, CLK, LD signal. The analog output signals from Ao1 to Ao4 are used to adjust the light intensity of the light emitting diode (LED) of the reflective sensor. Also, Ao5 and Ao6 output 5V or 0V and are used as the output ports.

(10) Analog multiplexer circuit

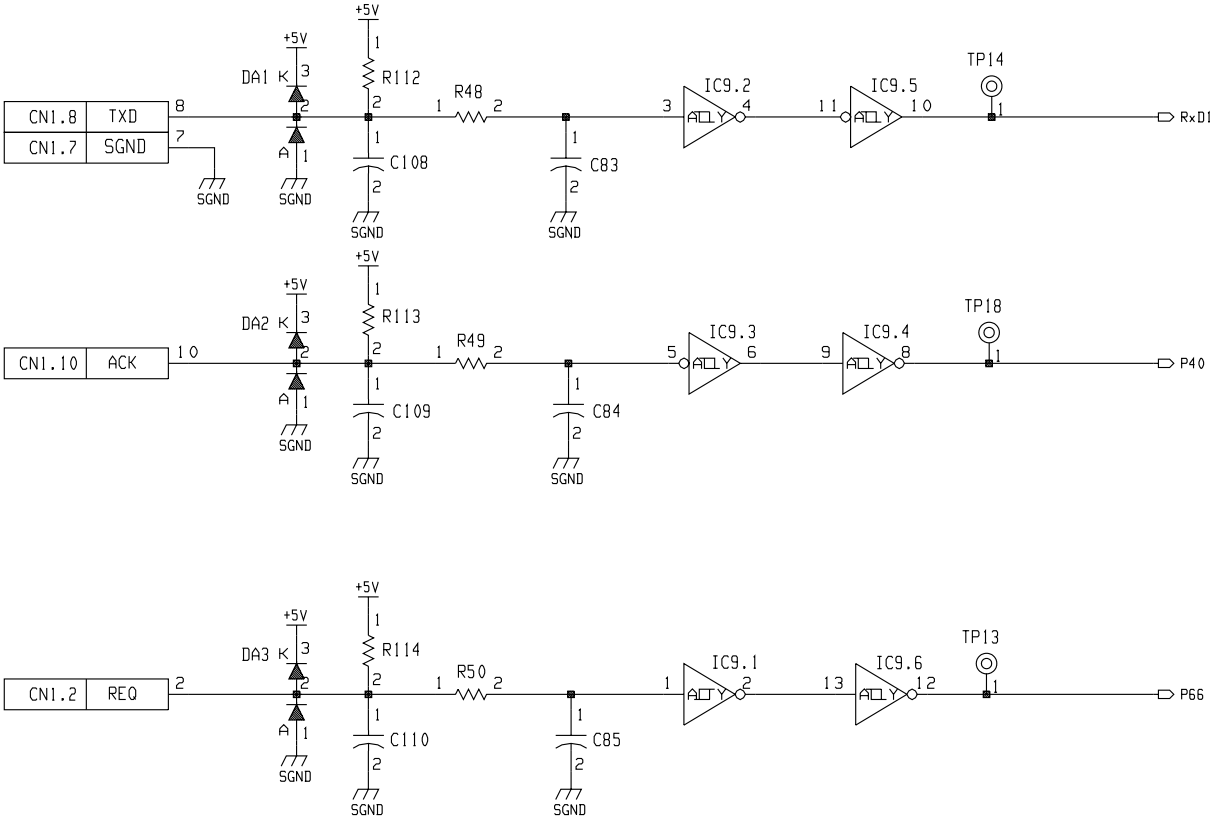


This is a circuit to connect to COM with one of the four analog input signals. As following table shows, the digital signals input into IC7-11pin(A), IC7-10pin(B) and IC7-9pin(C) switch the corresponding channels and IC7-3pin(COM) at a high speed, and they are input into the A-D input terminal of CPU. Each channel signal is an analog output signal of the reflective sensor and used to adjust the sensor automatically.

C	B	A	Corresponding Channel
L	L	L	0
L	L	H	1
L	H	L	2
L	H	H	3

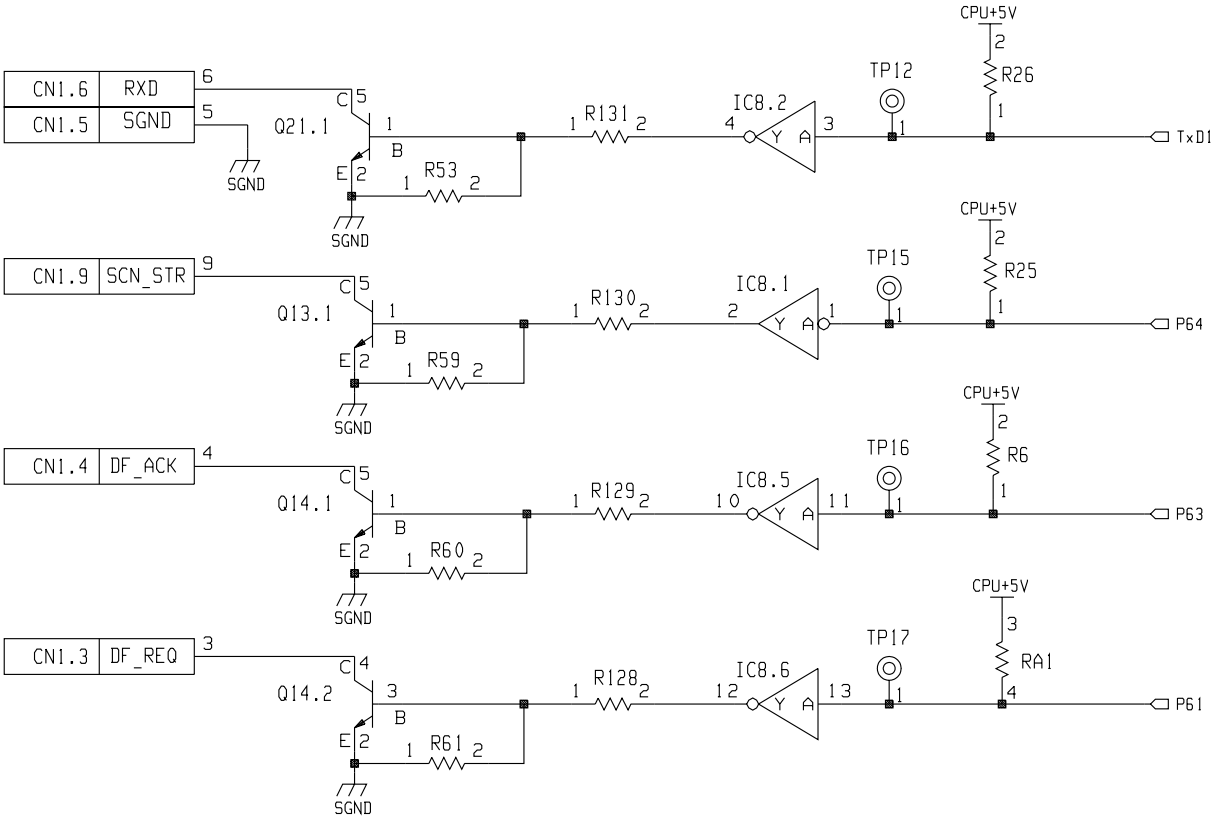
16. 12. Input/Output Signals

(1) TXD/ACK/REQ signals



This is an input circuit to communicate with the copier. “1” substitutes 5V and “0” substitetes 0V. The same logic is used in both the connector and CPU input port.

(2) RXD/SCN-STR/DF_ACK/DF_REQ signals



This is an input circuit to communicate with the copier. “1” substitutes 5V and “0” substitetes 0V. The same logic is used in both the connector and CPU output port.

(3) Input circuits for each sensor

RADF open/close sensor

APS operation sensor

Original width sensor 1

Original width sensor 2

Original width sensor 3

Registration sensor

Empty sensor

Upper limit sensor

Lower limit sensor

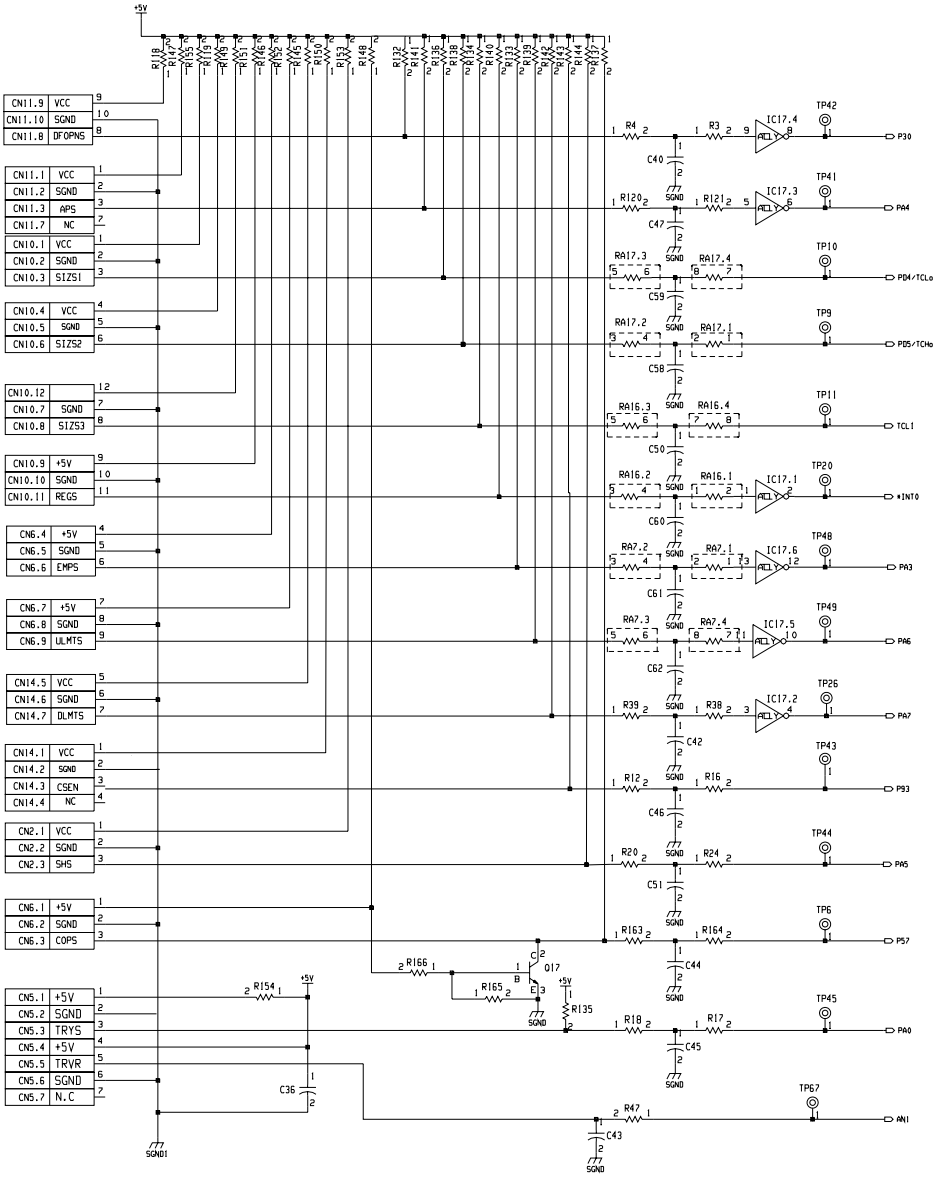
Intermediate transport sensor

Small original exit sensor

Cover open/close sensor

Tray sensor

Tray width sensor

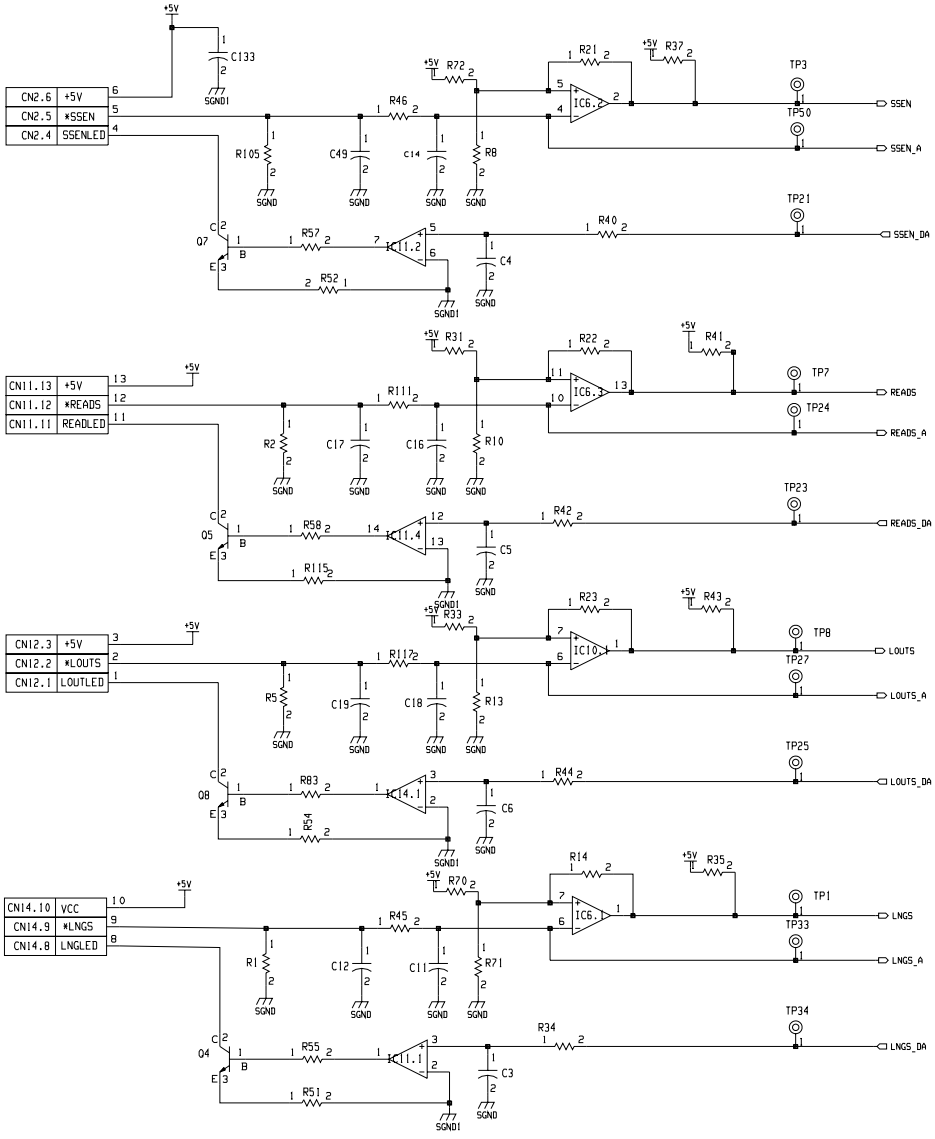


Small original reverse sensor

Read sensor

Large original exit sensor

Original length sensor



These are the input circuits from each photosensor.

Signal logic

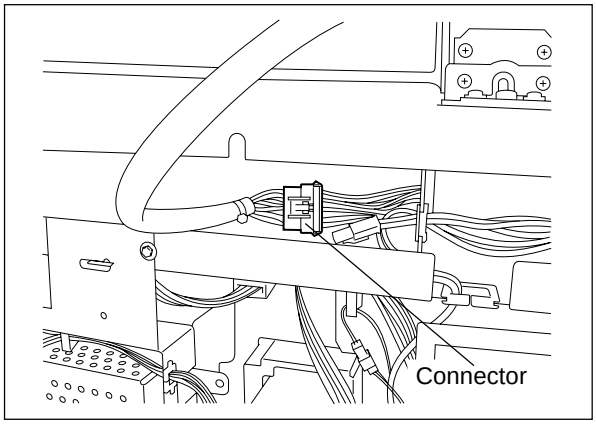
Sensor	Connector level 5V(“1”)	Connector level 0V(“0”)
DFOPNS (RADF open/close sensor)	RADF open	RADF close
APS (APS operation sensor)	APS OFF	APS ON
COPS (Cover open/close sensor)	Cover close	Cover open
EMPS (Empty sensor)	No original	Original existing
ULMTS (Upper limit sensor)	Upper limit	—
SIZES 1 (Original width sensor 1)	Original existing	No original
SIZES 2 (Original width sensor 2)	Original existing	No original
SIZES 3 (Original width sensor 3)	Original existing	No original
REGS (Registration sensor)	Original existing	No original
TRYS (Tray sensor)	Original existing	No original
LIMTS (Lower limit sensor)	Lower limit	—
ITFS (Intermediate transport sensor)	Original existing	No original
SOES (Small original exit sensor)	Original existing	No original
READS (Read sensor)	No original	Original existing
SSBS (Small original reverse sensor)	No original	Original existing
LOES (Large original exit sensor)	No original	Original existing
LNGS (Original length sensor)	No original	Original existing

Sensor	Connector level more than 4V	Connector level less than 1V
TRVR (Tray width sensor)	Guide muximum	Guide minimum

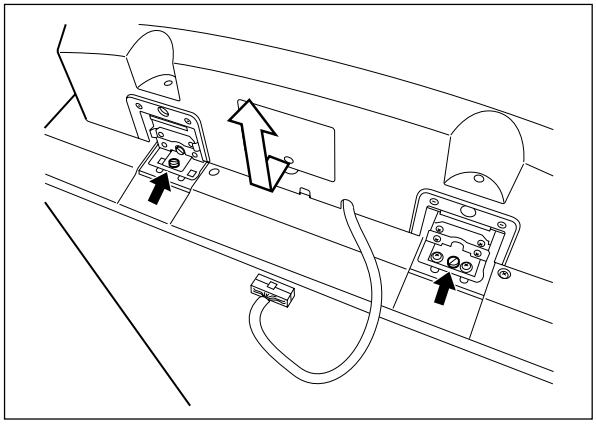
16. 13. Disassembly and Replacement

[A] RADF unit

(1) Remove the rear cover and disconnect 1 connector.



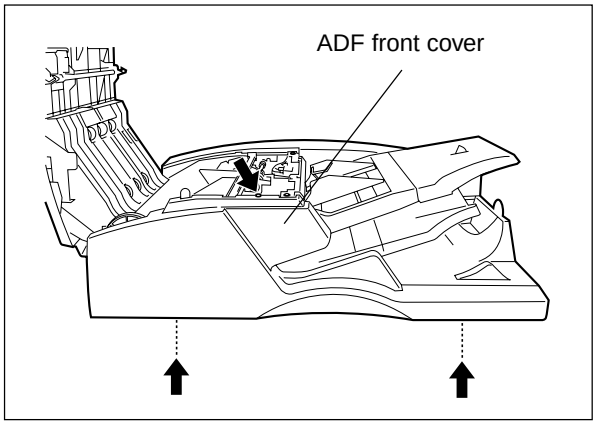
(2) Remove 2 screws, open and move the RADF unit toward the rear side and take it off upward.



[B] Covers

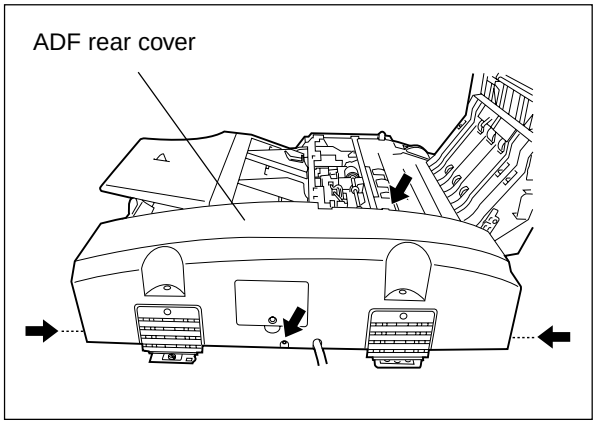
(B-1) ADF front cover

(1) Open the jam access cover, remove 3 screws and take off the ADF front cover.



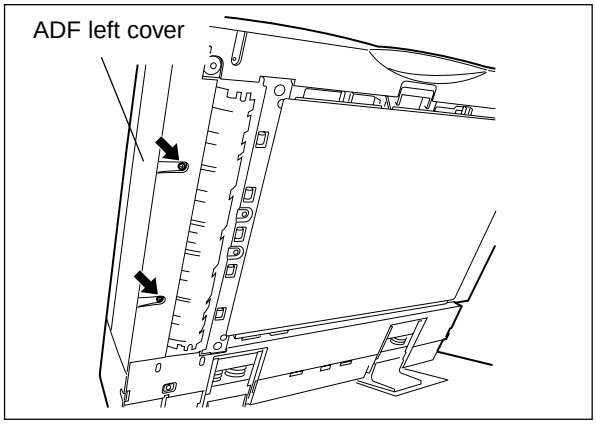
(B-2) ADF rear cover

(1) Open the jam access cover, remove 4 screws and take off the ADF rear cover.



(B-3) ADF left cover

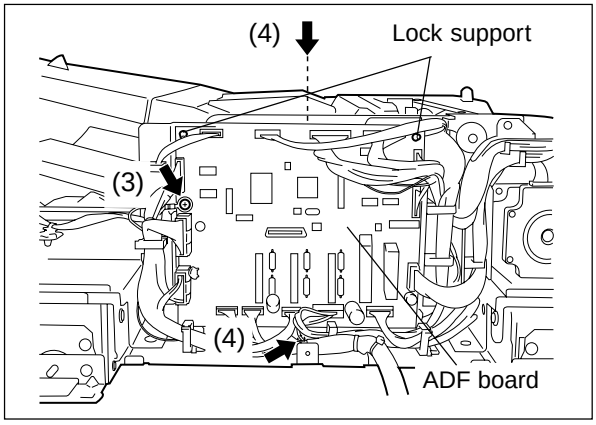
(1) Remove 2 screws and take off the ADF left cover while moving it downward.



[C] ADF board

(1) Remove 4 screws and take off the rear cover.
(2) Disconnect all 15 connectors from the board.
(3) Remove 1 screw and 2 lock supports and take off the ADF board.
(4) Remove 2 screws, release the harness from the clamp and take off the braket.

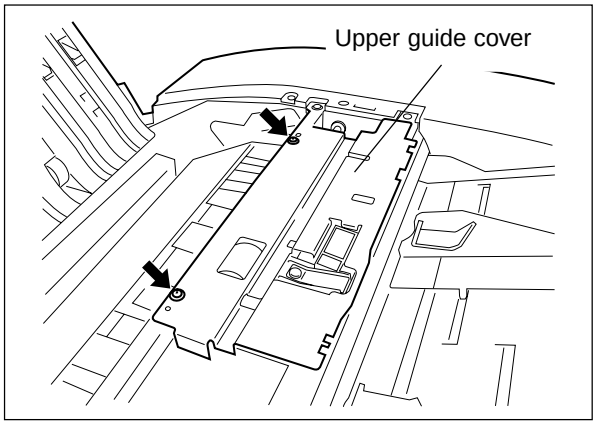
Note: By disconnecting 15 connectors and removing 3 screws mentioned at the above (2), (3) and (4), ADF board can be taken off with the bracket.



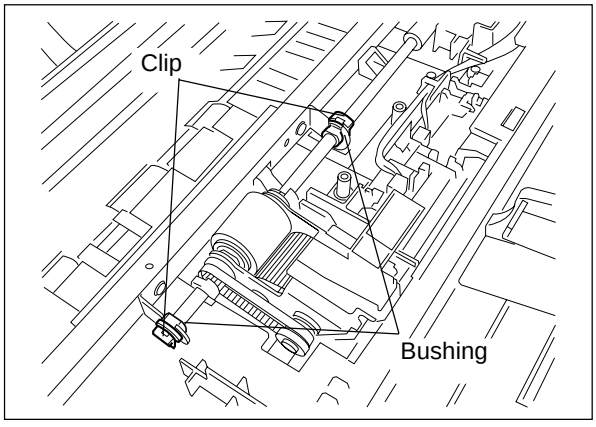
[D] Rollers

(D-1) Pickup roller/Feed roller

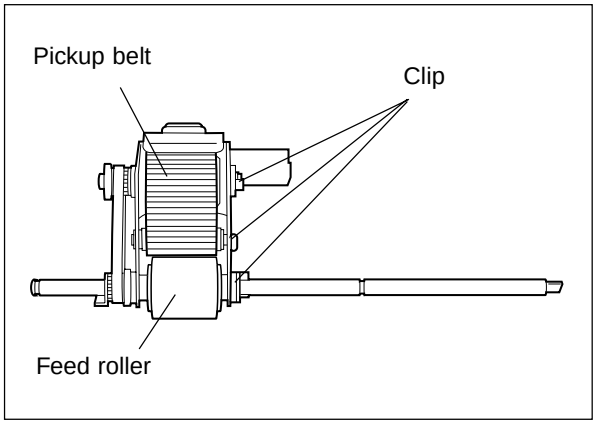
(1) Open the jam access cover.
(2) Remove 2 screws and take off the upper guide cover.



(3) Remove the clips at the pickup unit, displace the bushings and take off the pickup unit.

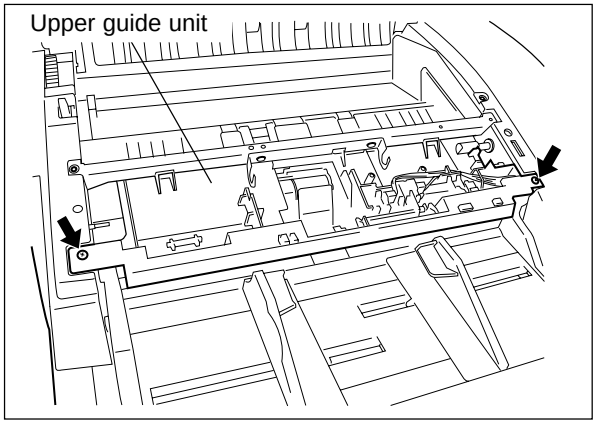


(4) Remove 3 clips and pull out the feed roller shaft, pickup roller belt and pickup intermediate shaft. Then take off the pickup belt and feed roller.

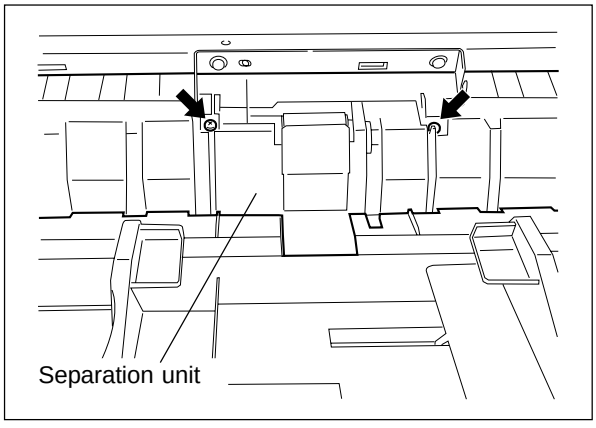


(D-2) Separation roller

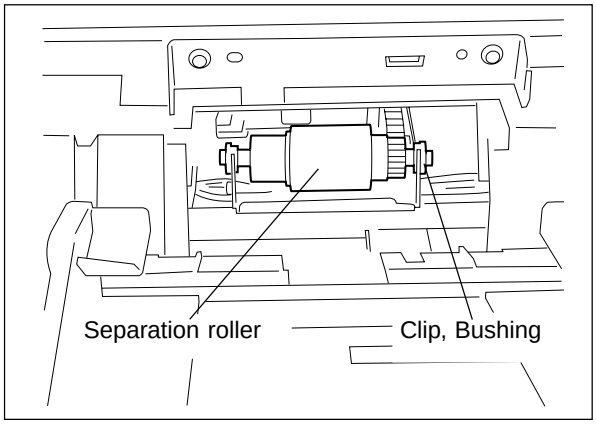
(1) Open the jam access cover.
(2) Remove the pickup unit.
(3) Remove 2 screws and take off the upper guide unit.



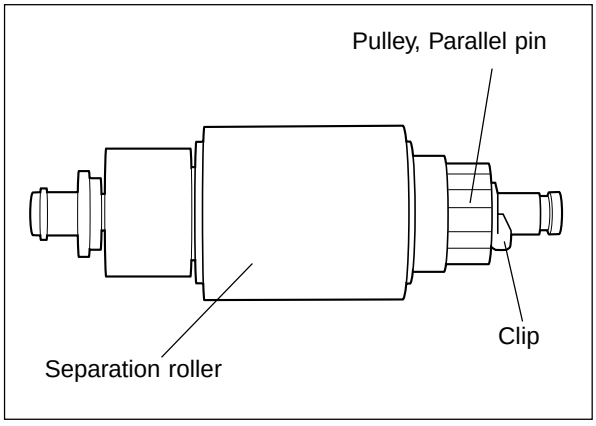
(4) Remove 2 screws and take off the separation unit.



(5) Remove the clip at the rear side, displace the bushing and take off the separation roller from the holder.



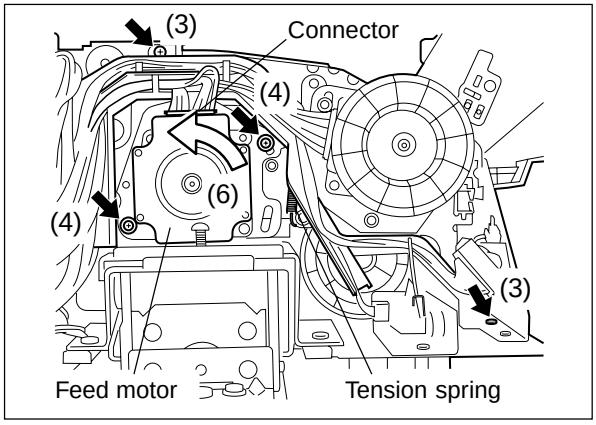
(6) Remove the clip and pull out the pulley, parallel pin and separation roller from the shaft.



[E] Motors

(E-1) Feed motor

(1) Open the jam access cover.
(2) Remove the ADF rear cover.
(3) Remove 2 screws of the harness cover and slack off the harness.
(4) Disconnect 1 connector, take off the tension spring, remove 2 screws and take off the feed motor with the tension bracket.
(5) Remove 2 screws and release the feed motor from the tension bracket.



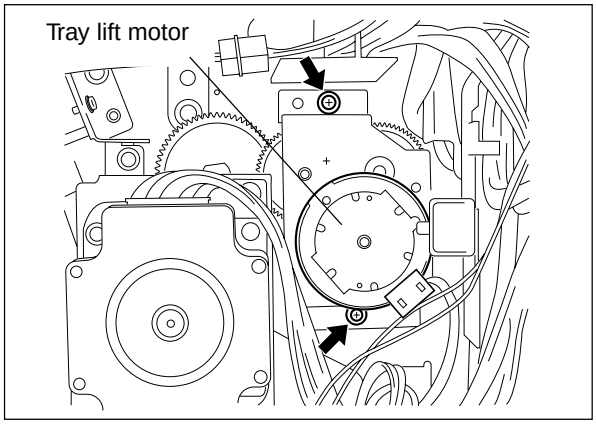
<Installing procedure>

(6) After installing the feed motor to the tension bracket, move it toward the direction of the white arrow and tack it temporarily to the feed motor bracket with 2 screws.
(7) Hang the timing belt around the pulley of the feed motor.
(8) Loosen 2 belt tension screws temporarily and hook the motor tension spring on the tension bracket and frame. Then tighten up the screws while stretching the timing belt.

Note: Make sure that the timing belt is not moved to the edges.

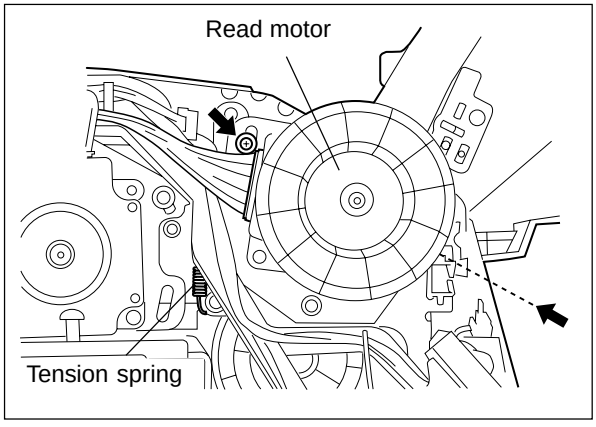
(E-2) Tray lift motor

(1) Remove the ADF rear cover.
(2) Remove the ADF board with the bracket.
(3) Remove 2 screws and take off the tray lift motor with the bracket.
(4) Pull out 2 pullies from the shaft and release the tray lift motor from the bracket.



(E-3) Read motor

(1) Remove the ADF rear cover.
(2) Remove the tension spring.
(3) Disconnect 1 connector.
(4) Remove 2 screws and take off the read motor with the bracket.
(5) Remove 2 screws and release the read motor from the bracket.



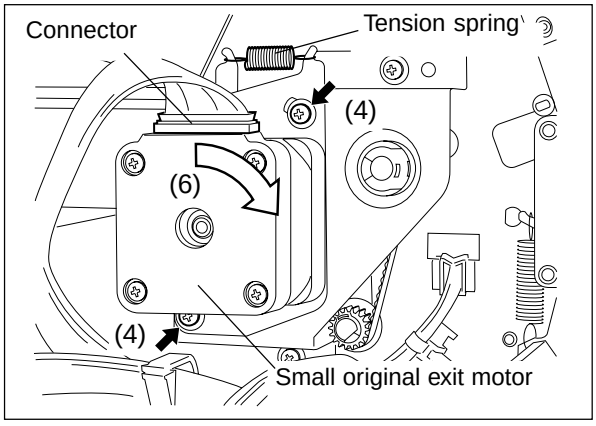
<Installing procedure>

(6) Install the read motor to the bracket. While hunging the timing belt around both pullies at the RADF unit and read motor, move the bracket downward and tack it there temporarily with 2 screws.
(7) Hook the tension spring on the brackets.
(8) Loosen the screws temporarily, and tighten them up while stretching the timing belt.

Note: Make sure that the timing belt is not moved to the edges.

(E-4) Small original exit motor

(1) Remove the ADF rear cover.
(2) Remove the ADF board with the bracket.
(3) Remove the tension spring.
(4) Disconnect 1 connector, remove 2 screws and take off the small original exit motor with the tension bracket.
(5) Remove 2 screws and release the small original exit motor from the tension bracket.



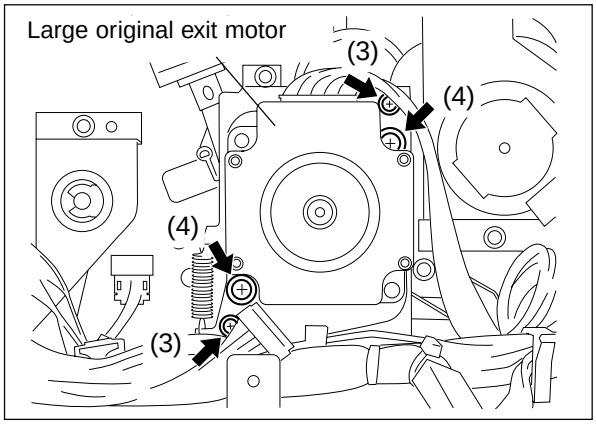
<Installing procedure>

(6) Install the small original exit motor to the tension bracket. While hunging the timing belt around the pulley of the small original exit motor, move the tension bracket fully to the right side and tack it there temporarily with 2 screws.
(7) Hook the tension spring on the tension brackets.
(8) Loosen the screws temporarily, and tighten them up while stretching the timing belt.

Note: Make sure that the timing belt is not moved to the edges.

(E-5) Large original exit motor

(1) Remove the ADF rear cover.
(2) Remove the ADF board with the bracket.
(3) Loosen 2 screws, move the large original exit motor fully downward and tack it there temporarily.
(4) Remove 2 screws and take off the large original exit motor.



<Installing procedure>

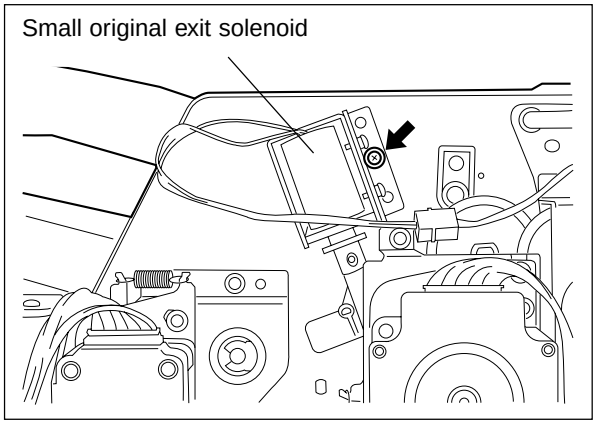
(5) While hunging the timing belt around the pulley of the large original exit motor, tack the large original exit motor to the tension bracket temporarily with 2 screws.
(6) Loosen the screws temporarily, and tighten them up while stretching the timing belt.

Note: Make sure that the timing belt is not moved to the edges.

[F] Solenoids

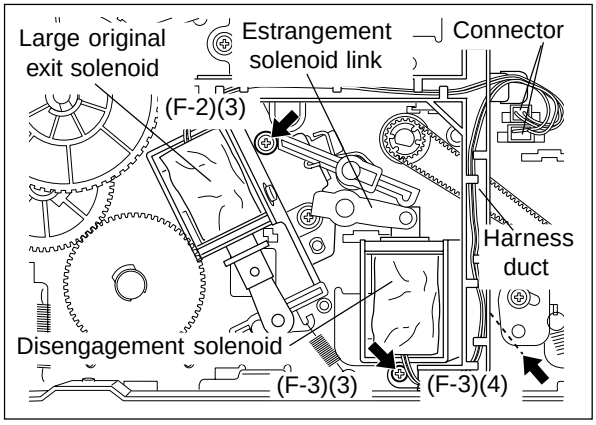
(F-1) Small original exit solenoid

(1) Remove the ADF rear cover.
(2) Remove the ADF board with the bracket.
(3) Remove the large original exit motor.
(4) Remove 1 screw and take off the small original exit solenoid with the bracket.
(5) Remove 2 screws and release the small original exit solenoid from the bracket.



(F-2) Large original exit solenoid

(1) Remove the ADF front cover while keeping the jam access cover open.
(2) Disconnect 1 connector.
(3) Remove 1 screw and take off the large original exit solenoid with the bracket.
(4) Remove 1 screw and release the large original exit solenoid from the bracket.



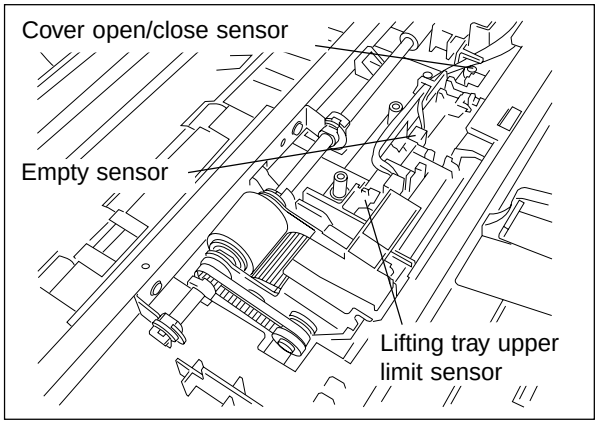
(F-3) Disengagement solenoid

(1) Remove the ADF front cover.
(2) Remove the clip and take off the disengagement solenoid link.
(3) Remove 1 screw fixing the harness duct, release 2 latches and move the harness duct to the right side.
(4) Remove 1 screw fixing the disengagement solenoid bracket, disconnect 1 connector and take off the disengagement solenoid with the bracket.
(5) Remove 2 screws and release the disengagement solenoid from the bracket.

[G] Sensors/Switches

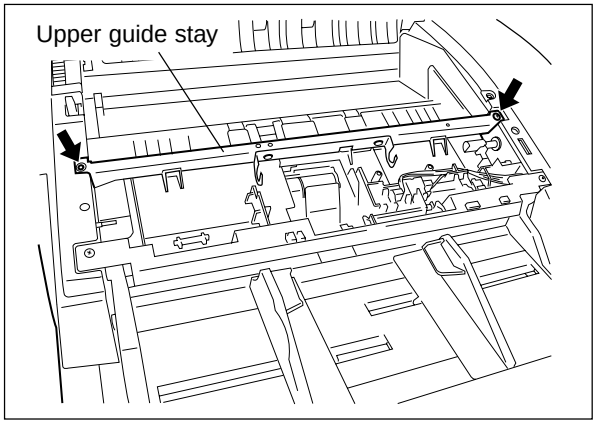
(G-1) Lifting tray upper limit sensor/Empty sensor/ Cover open/close sensor

(1) Open the jam access cover, remove 2 screws and take off the upper guide cover.
(2) Disconnect the connectors and release the latches and take off the lifting tray upper limit sensor, empty sensor and cover open/close sensor.

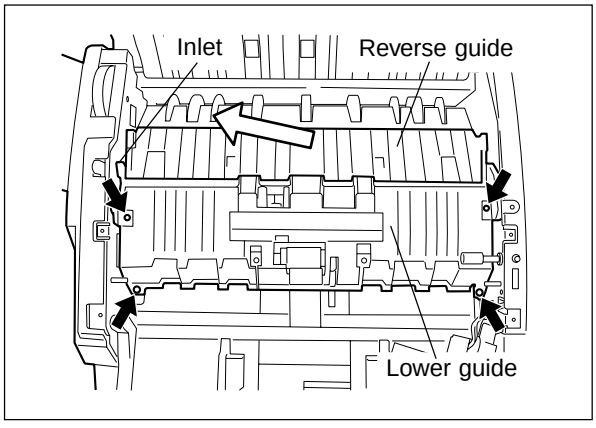


(G-2) Lifting tray lower limit sensor

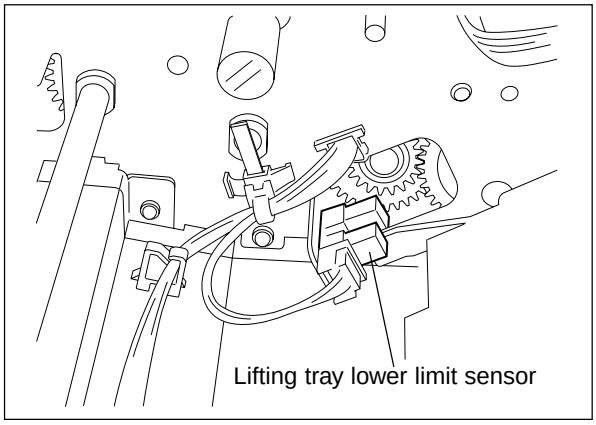
(1) Remove the upper guide unit.
(2) Remove 2 screws and take off the upper guide stay.



(3) Open the reverse guide, unjoint the front side inlet and take off the guide toward the front side.
(4) Remove 4 screws and take off the lower guide.

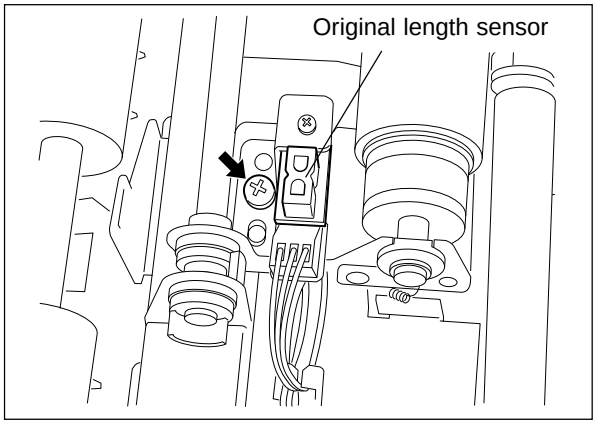


(5) Disconnect 1 connector and take off the lifting tray lower limit sensor.



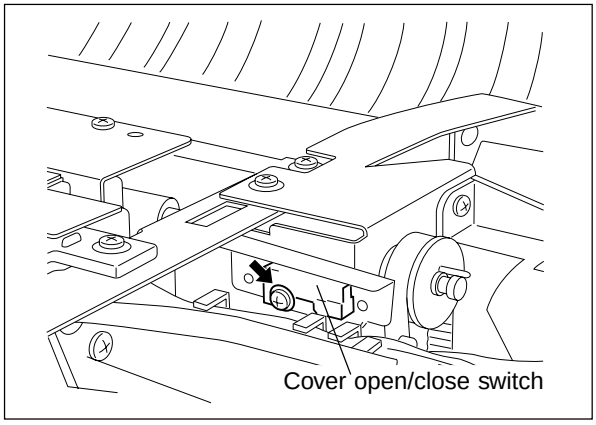
(G-3) Original length sensor

(1) Remove the lower guide.
(2) Remove 1 screw, disconnect 1 connector and take off the original length sensor with the bracket.
(3) Remove 1 screw and release the original length sensor from the bracket.



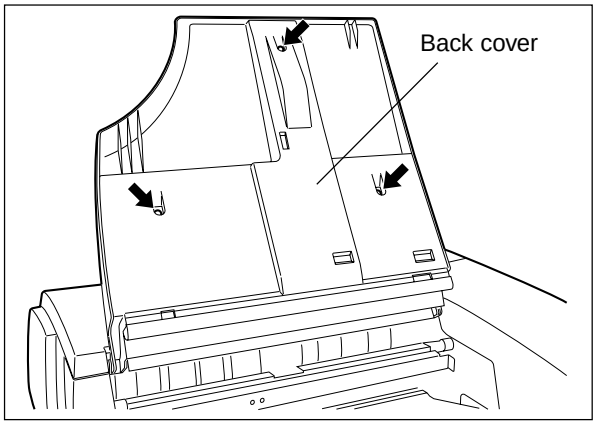
(G-4) Cover open/close switch

(1) Remove the ADF rear cover.
(2) Remove 1 screw and take off the cover open/close switch.

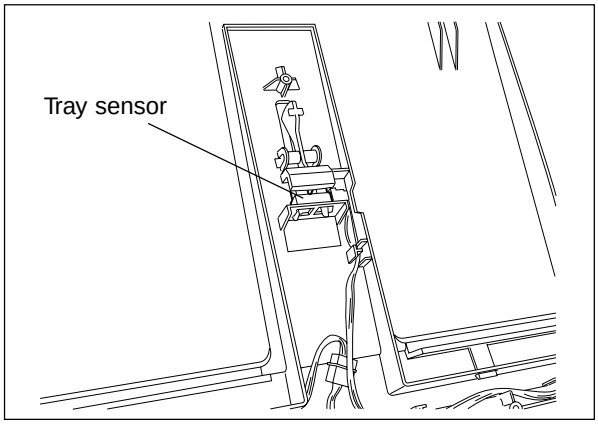


(G-5) Tray sensor

(1) Open the tray, remove 3 screws and take off the back cover.



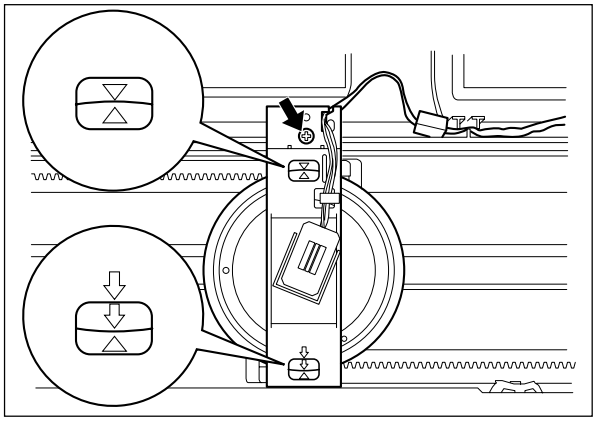
(2) Disconnect 1 connector, release the latches and take off the tray sensor.



(G-6) Tray width sensor

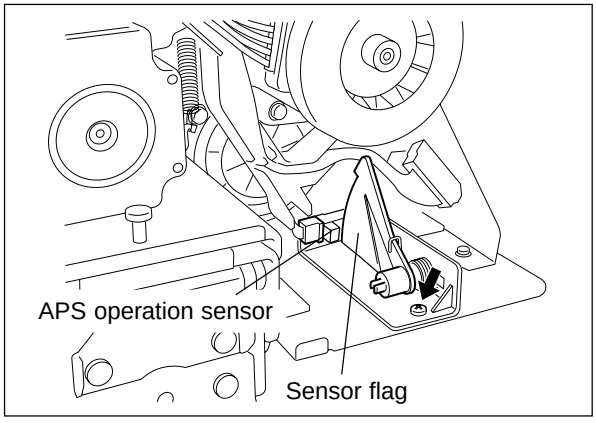
(1) Open the tray, remove 3 screws and take off the back cover.
(2) Disconnect 1 connector, remove 1 screw and take off the tray width sensor.

Note: Put together both marks at the rack and pinion as shown by the right figure when installing the tray width sensor.



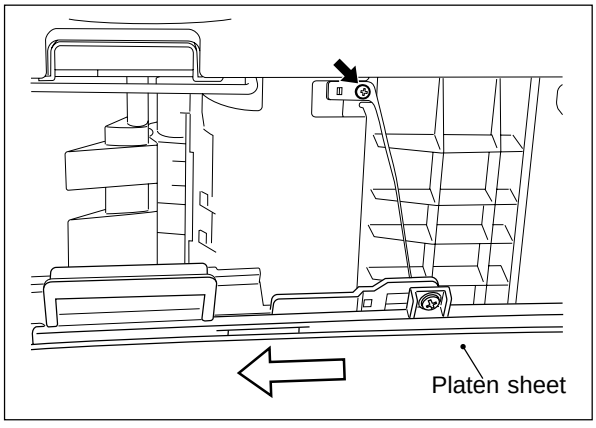
(G-7) APS operation sensor

(1) Remove the ADF rear cover.
(2) Disconnect 1 connector.
(3) Remove 1 screw and take off the APS operation sensor with the bracket.
(4) While turning the sensor flag to deflect the light shielding section from the sensor, release the latches and take off the APS operation sensor.

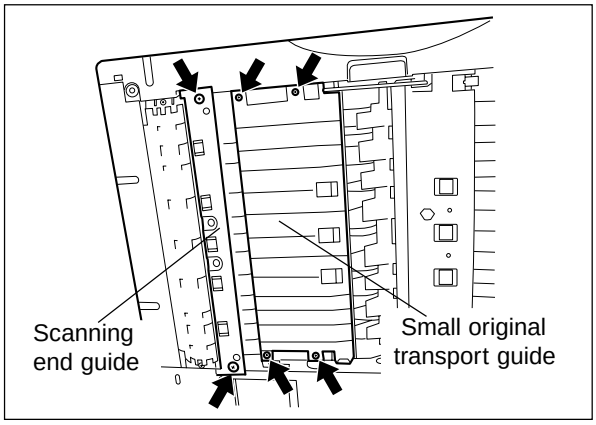


(G-8) Intermediate transport sensor

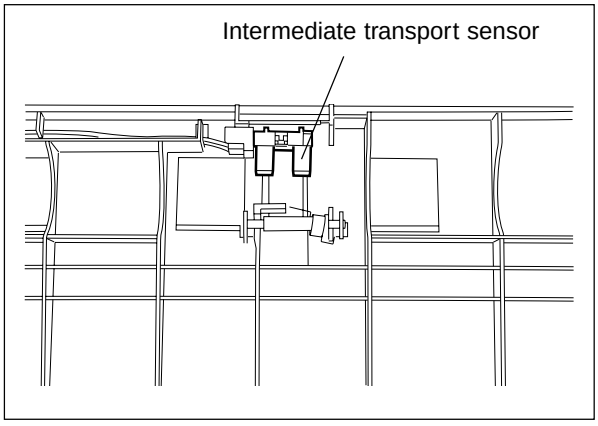
(1) Open the platen sheet and remove 1 screw fixing the band.
(2) Move the platen sheet toward the direction of the white arrow to deflect the fulcrum and take it off.



(3) Remove 2 screws and take off the scanning end guide.
(4) Remove 4 screws and take off the small original transport guide.



(5) Disconnect 1 connector, release the latches and take off the intermediate transport sensor.

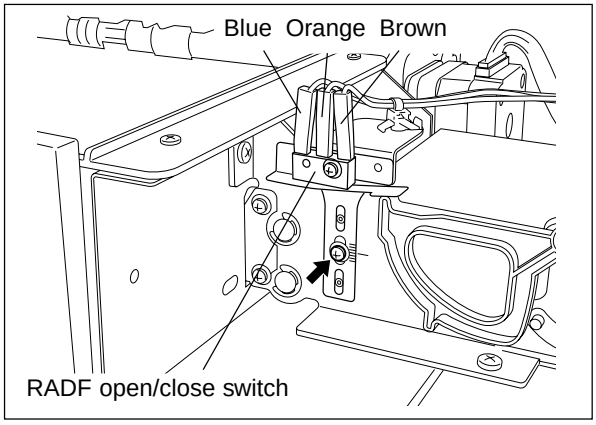


(G-9) RADF open/close switch

(1) Remove the ADF rear cover.
(2) Disconnect 3 connectors.
(3) Remove 1 screw and take off the RADF open/close switch with the bracket.
(4) Remove 1 screw and release the RADF open/close switch from the bracket.

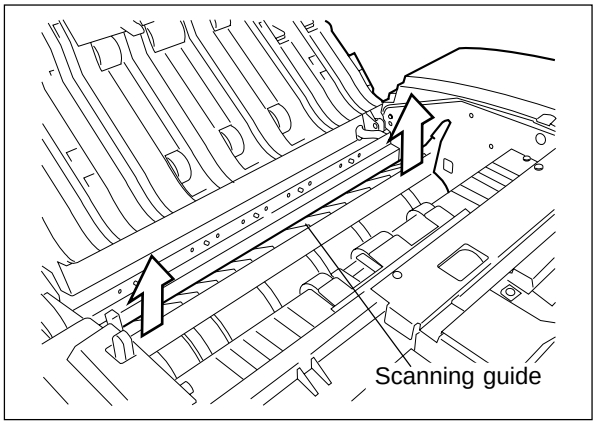
<Installing procedure>

(5) After installing the RADF open/close switch to the bracket, connect the connectors to it in the alignment shown by the right figure.

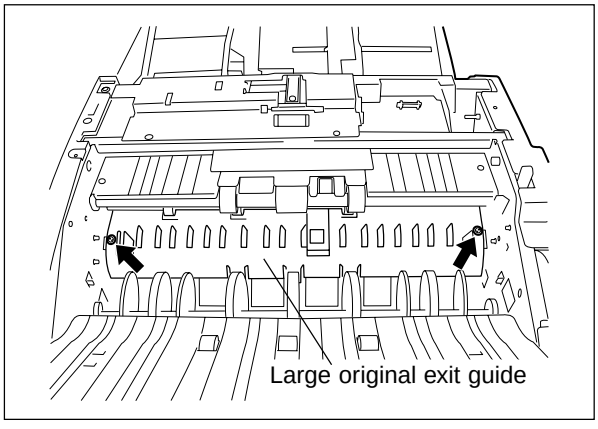


(G-10) Large original exit sensor

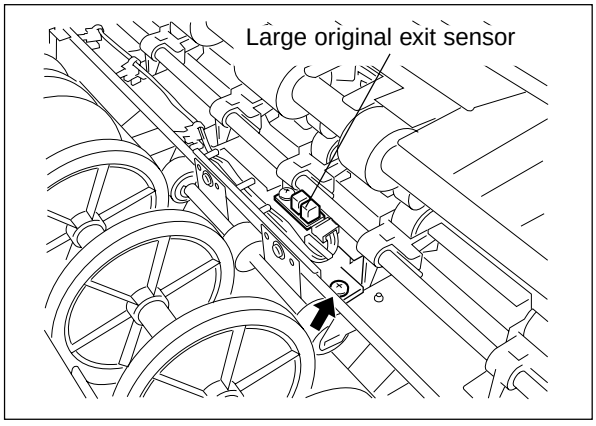
(1) Open the jam access cover.
(2) Open the reverse guide and unjoint the front side inlet and take off the guide toward the front side.
(3) Open the scanning guide, unjoint the inlets at both sides and take off the guide upward while holding both sides.



(4) Remove 2 screws and take off the large original exit guide.

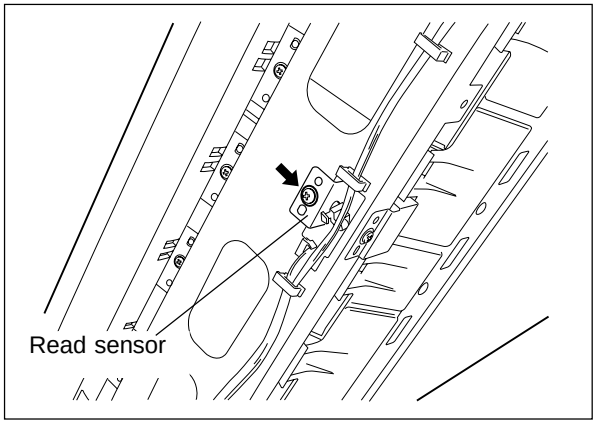


(5) Remove 1 screw, disconnect 1 connector and take off the large original exit sensor with the bracket.
(6) Remove 1 screw and release the large original exit sensor from the bracket.



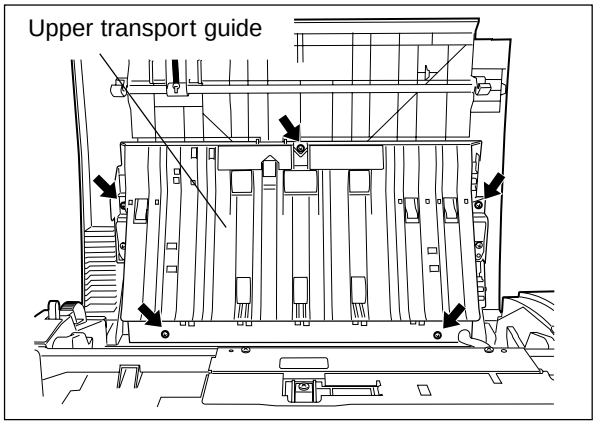
(G-11) Read sensor

(1) Remove the ADF left cover.
(2) Remove 1 screw, disconnect 1 connector and take off the read sensor with the bracket.
(3) Remove 1 screw and release the read sensor from the bracket.

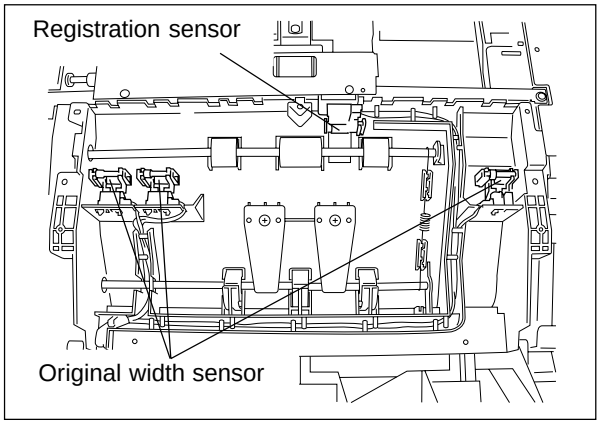


(G-12) Registration sensor/Original length sensor

(1) Remove the ADF left cover.
(2) Open the jam access cover, remove 5 screws and take off the upper transport guide.

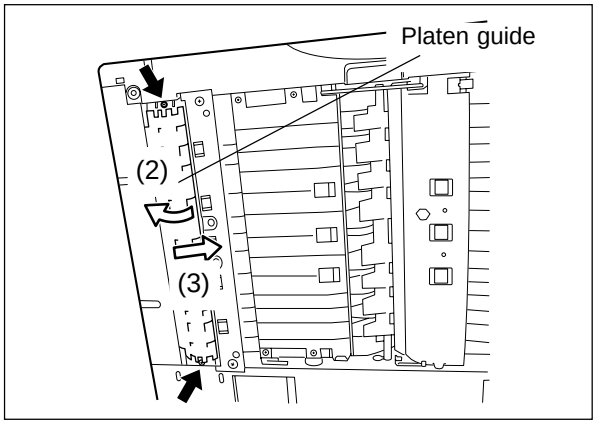


(3) Release each latch, disconnect each connector, and take off the registration sensor and original width sensors.



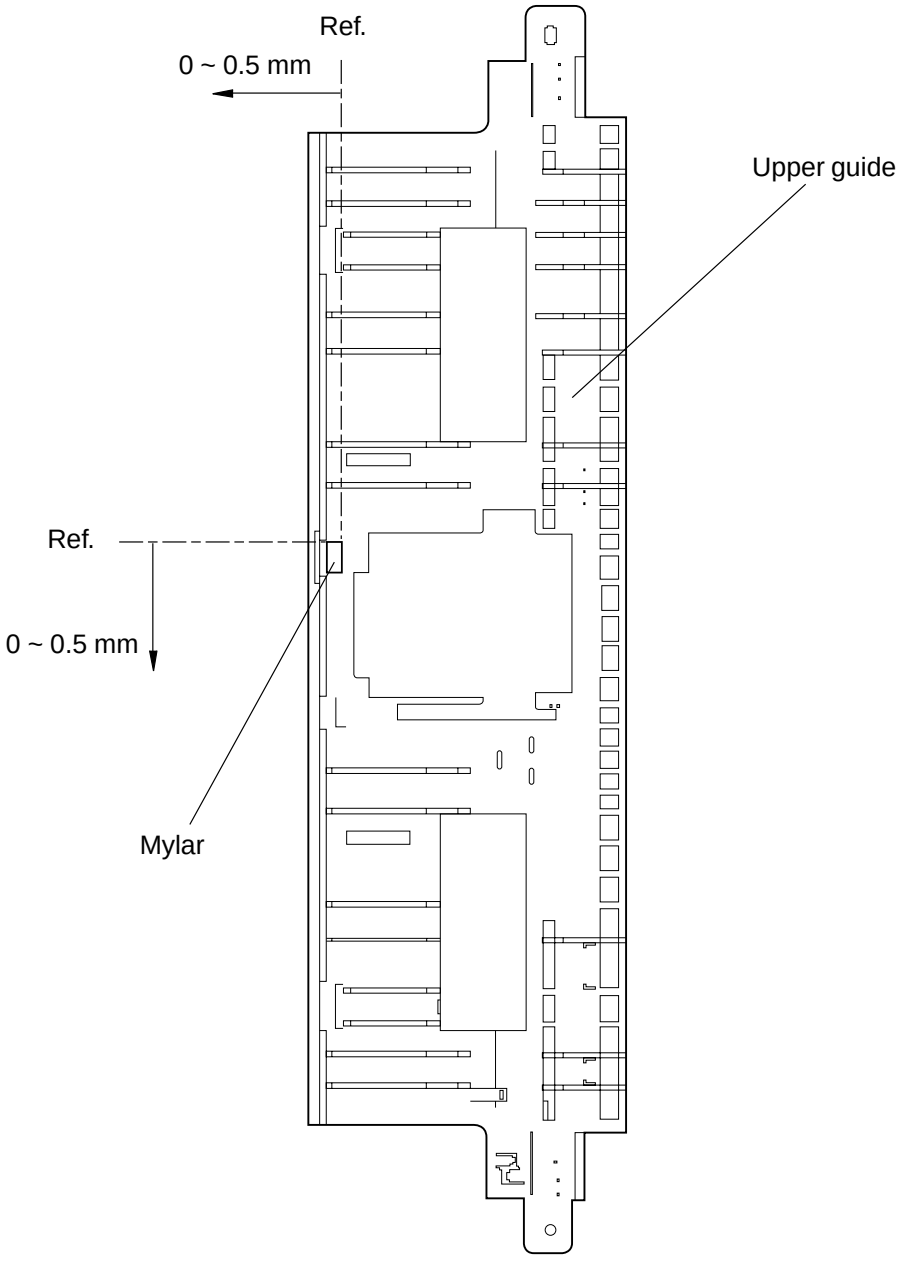
[H] Platen guide

(1) Remove 2 screws fixing the platen guide.
(2) Move the platen guide toward the direction of the white arrow until the right side edge of the guide can be seen.
(3) Remove the platen guide toward the direction of the white arrow.

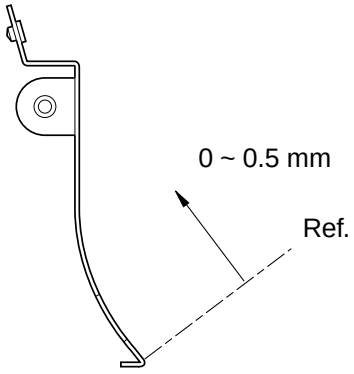


[I] Mylar and mirror seal

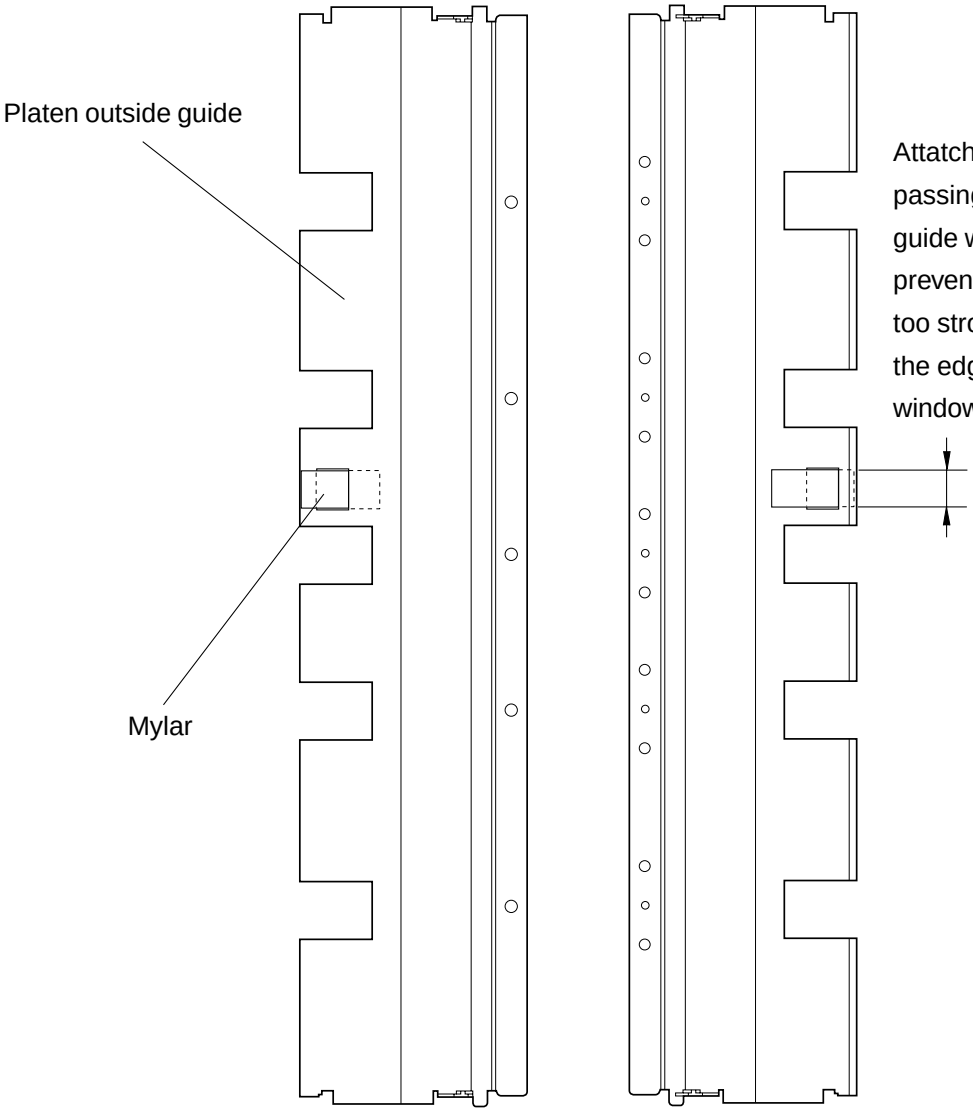
(I-1) Mirror seal for original length sensor



(I-2) Mylar for read sensor

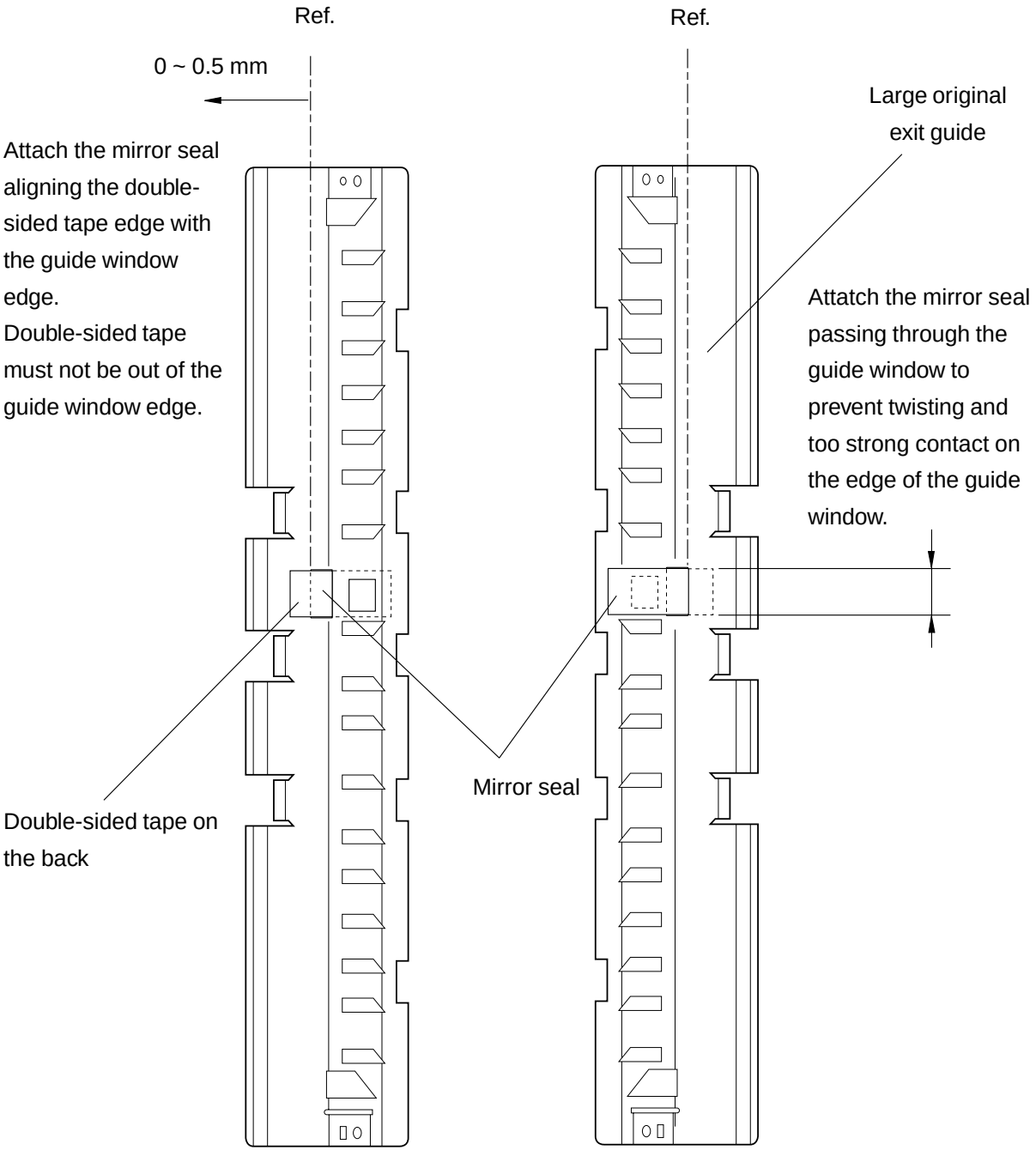


Attach the mylar aligning the edge of it with the corner end of the guide. Dispositioning from the corner end of the guide is not allowed.



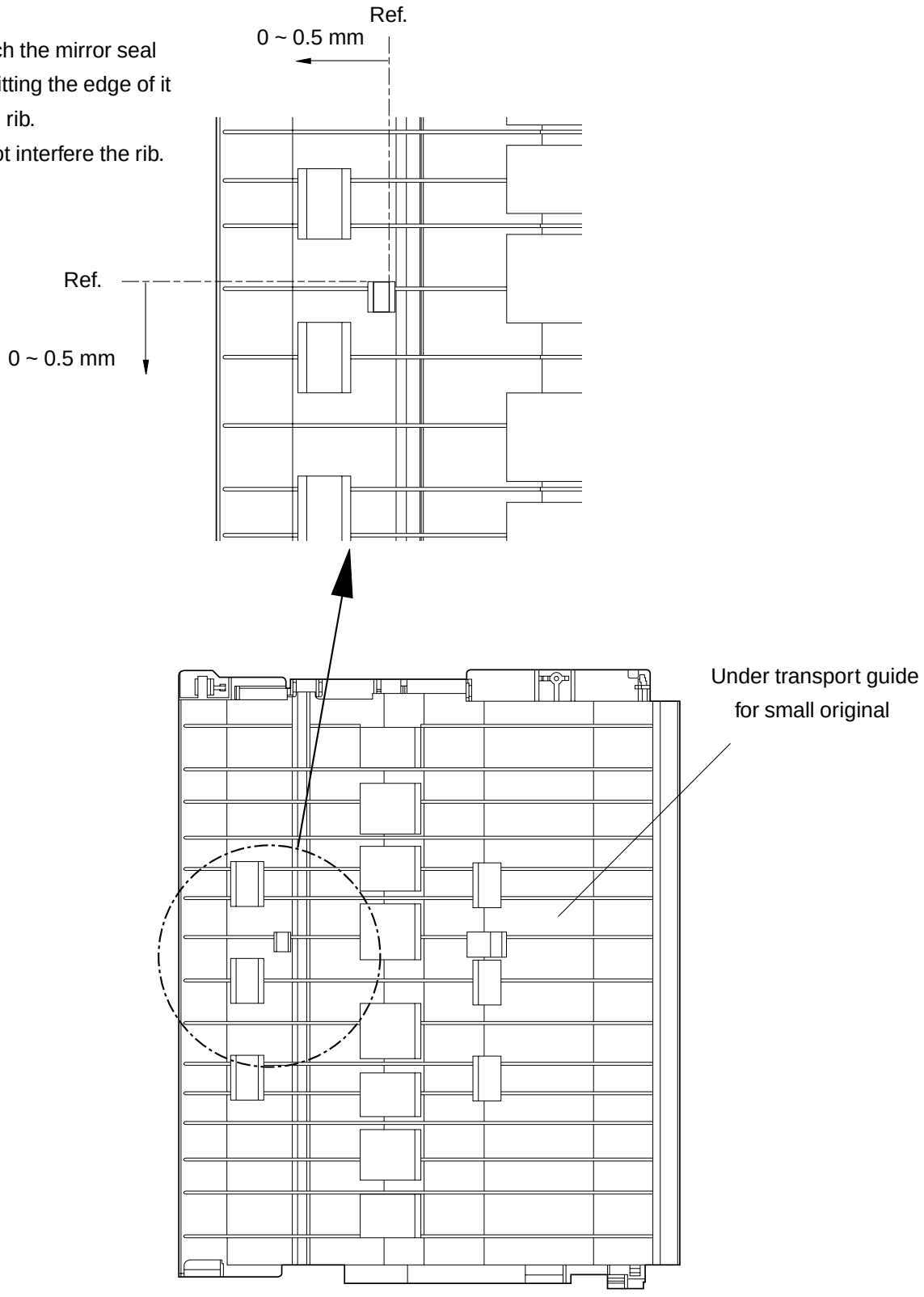
Attatch the mylar passing through the guide window to prevent twisting and too strong contact on the edge of the guide window.

(I-3) Mirror seal for large original exit sensor

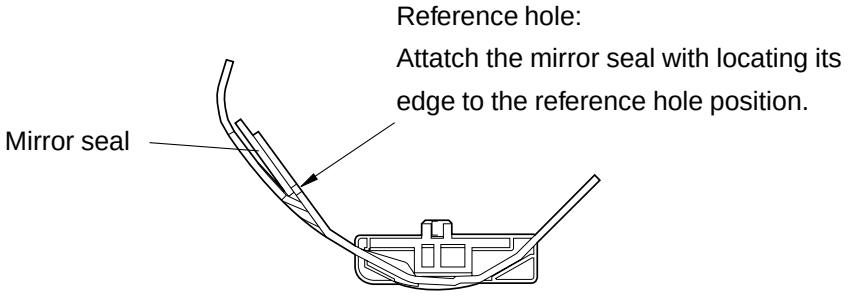

Ref.
Ref.
0 ~ 0.5 mm
Large original exit guide
Attach the mirror seal aligning the double-sided tape edge with the guide window edge.
Double-sided tape must not be out of the guide window edge.
Attatch the mirror seal passing through the guide window to prevent twisting and too strong contact on the edge of the guide window.
Mirror seal
Double-sided tape on the back

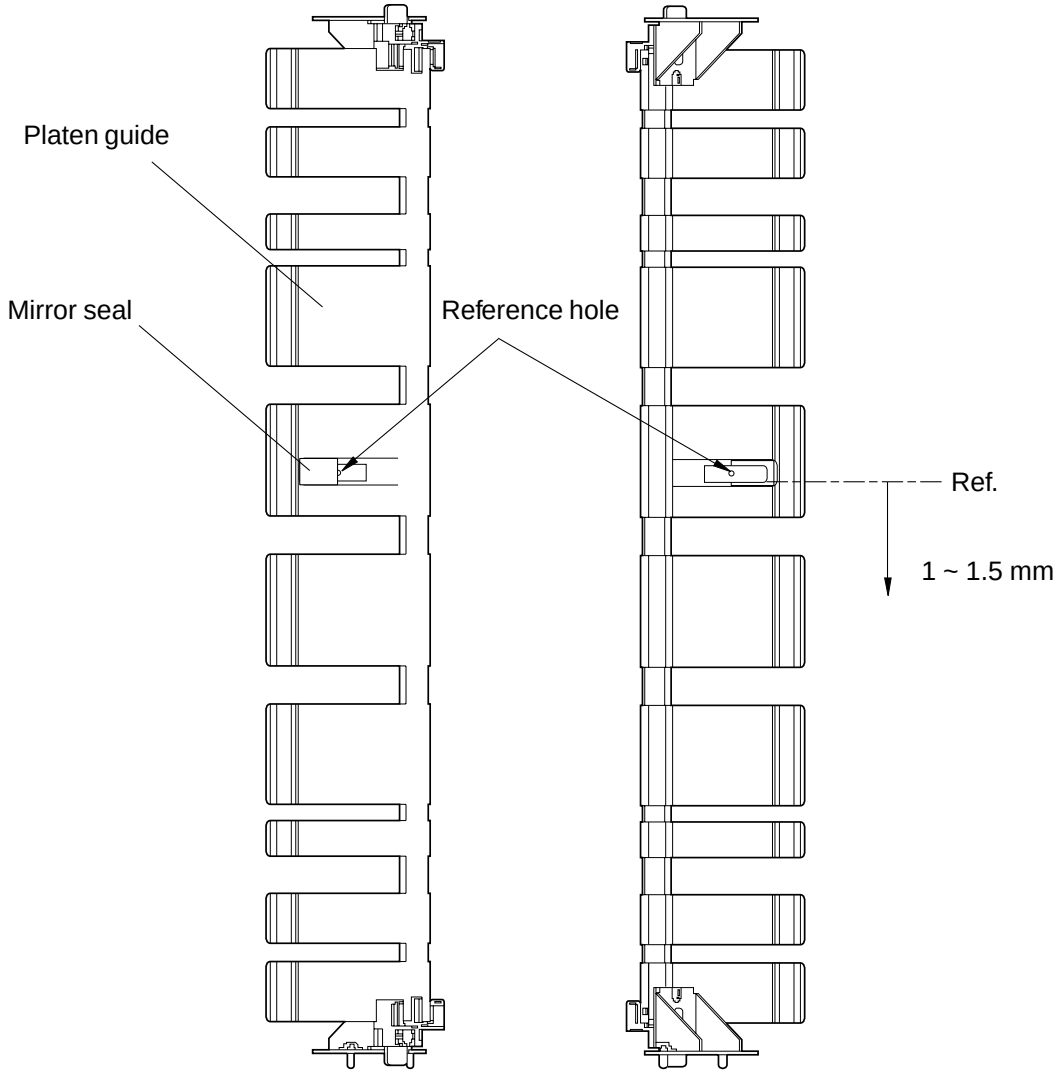
(I-4) Mirror seal for small original reversal sensor

Attatch the mirror seal
with fitting the edge of it
to the rib.
Do not interfere the rib.

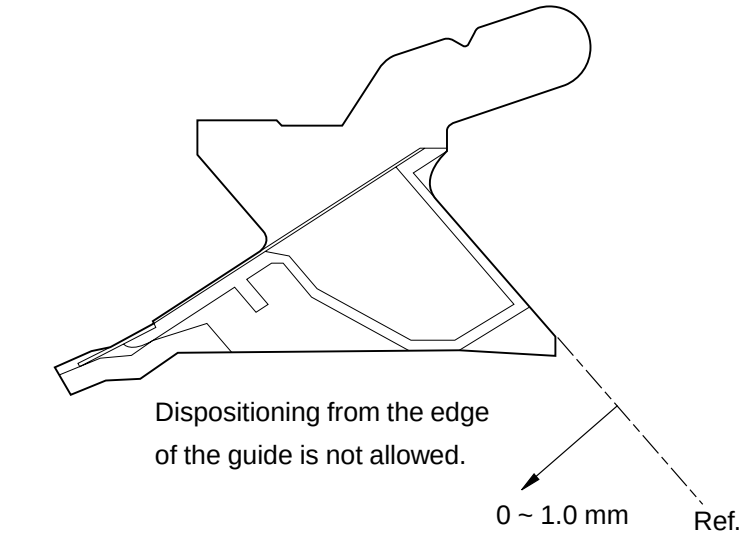


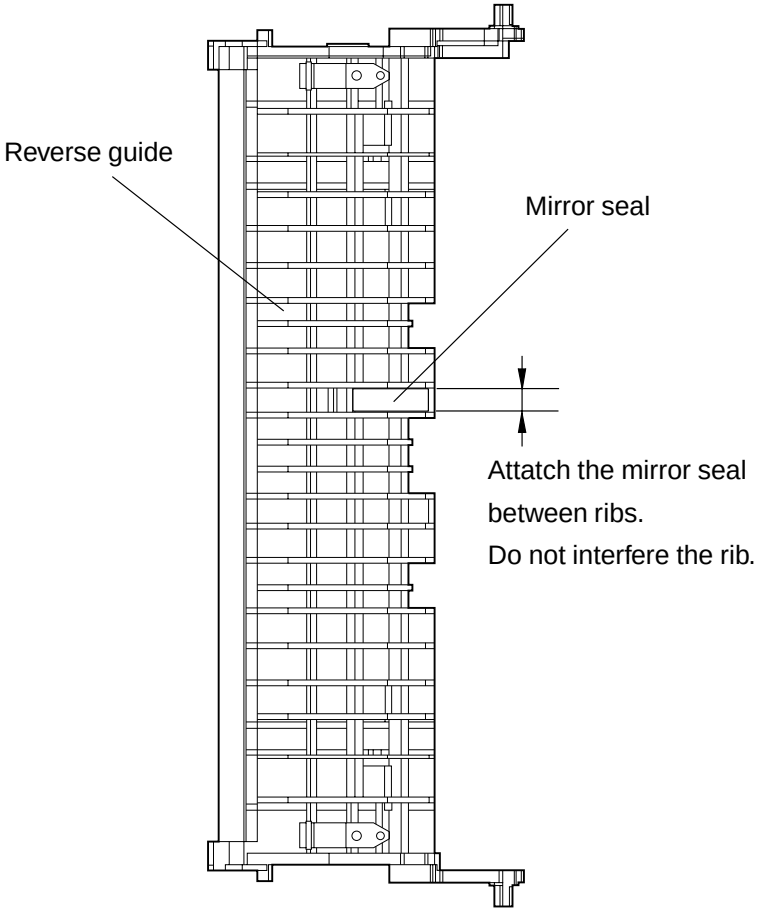
(I-5) Mirror seal for read sensor





(I-6) Mirror seal for large original exit sensor





17. POWER SUPPLY UNIT

17. 1. Construction
17. 2. Operation of DC Output Circuits
17. 3. Output Channel
17. 4. Fuse
17. 5. Configuration of Power Supply Unit
17. 6. Power Supply Sequence

17. POWER SUPPLY UNIT

17. 1. Construction

The power supply unit is comprised of the AC filter and insulation type DC output circuits.

(1) AC filter

AC filter eliminates noise from the outside and prevents the noise generated by the copier from leaking to the outside.

(2) DC output circuits

The DC outputs are roughly divided into the following two lines:

①Main switch system : Power supply used during image forming processes, consisting of the outputs of four voltages (+3.3V, +5.1V, +12V and +24V) which start up when the main switch is turned ON.

②Door switch system : Power supply used by the entire machine during image forming processes and supplied via the door switch, consisting of the outputs of 3 voltages (+5.1V, +24V and +36V) which start up when the main switch is turned ON with the door switch being ON.

17. 2. Operation of DC Output Circuits

(1) Start of operation

When the main switch of the copier is turned ON and if the door is closed, all the power supply systems start up at the same time.

(2) Stop of operation

When the main switch of the copier is turned OFF, a power-OFF signal (PWR-DN) is output after an instantaneous outage insurance time (20 ms mini.) has elapsed. After the power-OFF signal has been output, the main system power supply is allowed to retain its rated voltages for the minimum retaining time (50ms. or more) and then lets them start dropping.

(3) Output protection

Each output system includes an over-current protection circuit (a fuse and internal protection circuit) and an over-voltage protection circuit. This is to prevent abnormal operation or damage to the secondary circuit which may be caused by an over-current due to a shorted load or an over-voltage due to a short-circuit between different voltages.

If the protection circuit has been activated and the fuse is not blown out, remove the cause of the short-circuit and turn ON the power again to clear the circuit.

17. 3. Output Channel

There are 4 output channels which do not work with the door switch.

(1) 3.3V

3.3VA : J407 5pin
Output to PLG board

3.3VB : J408 5pin
Output to SLG board

3.3VC : J405 1pin, 2pin
Output to SYS board

(2) 5.1V

5.1VB : J405 5pin, 6pin
Output to SYS board and printer board (via SYS board)

5.1VC : J405 7pin
Output to HDD

5.1VD : J406 1pin, 2pin
Output to LGC board

5.1VE : J408 7pin, 8pin
Output to SLG board

5.1VF : J407 1pin
Output to PLG board

5.1VG : J407 2pin
Output to PLG board

5.1VH : J409 1pin
Output to Finisher

(3) 12V

12VA : J405 13pin
Output to HDD

12VB : J407 6pin
Output to PLG board

12VC : J408 11pin
Output to SLG board

12VD : J406 8pin
Output to LGC board

(4) 24V

24VF : J408 1pin, 2pin
Output to RADF

24VG : J406 4pin
Output to LGC board

There are 3 output channels which work with the door switch.

(1) 5.1V

5.1VA : J403 3pin
Output to PLG board

(2) 24V

24VA : J402 1pin
Output to LGC board

24VB : J402 2pin
Output to LGC board

24VC : J402 3pin
Output to LGC board

24VD : J403 1pin
Output to PLG board

24VE : J404 5pin
Output to SLG board

24VH : J409 3pin, 4pin
Output to Fnisher

(3) 36V

36VA : J402 7pin
Output to LGC board

36VB : J402 8pin
Output to LGC board

36VC : J404 1pin, 2pin
Output to SLG board

<<Output connector>>

Not working with the door switch

J405 for SYS board
J406 for LGC board
J407 for PLG board
J408 for SLG board
J409 for Finisier
(1pin, 2pin)

Working with the door switch

J402 for LGC board
J403 for PLG board
J404 for SLG board
J409 for Finisher
(3pin~6pin)

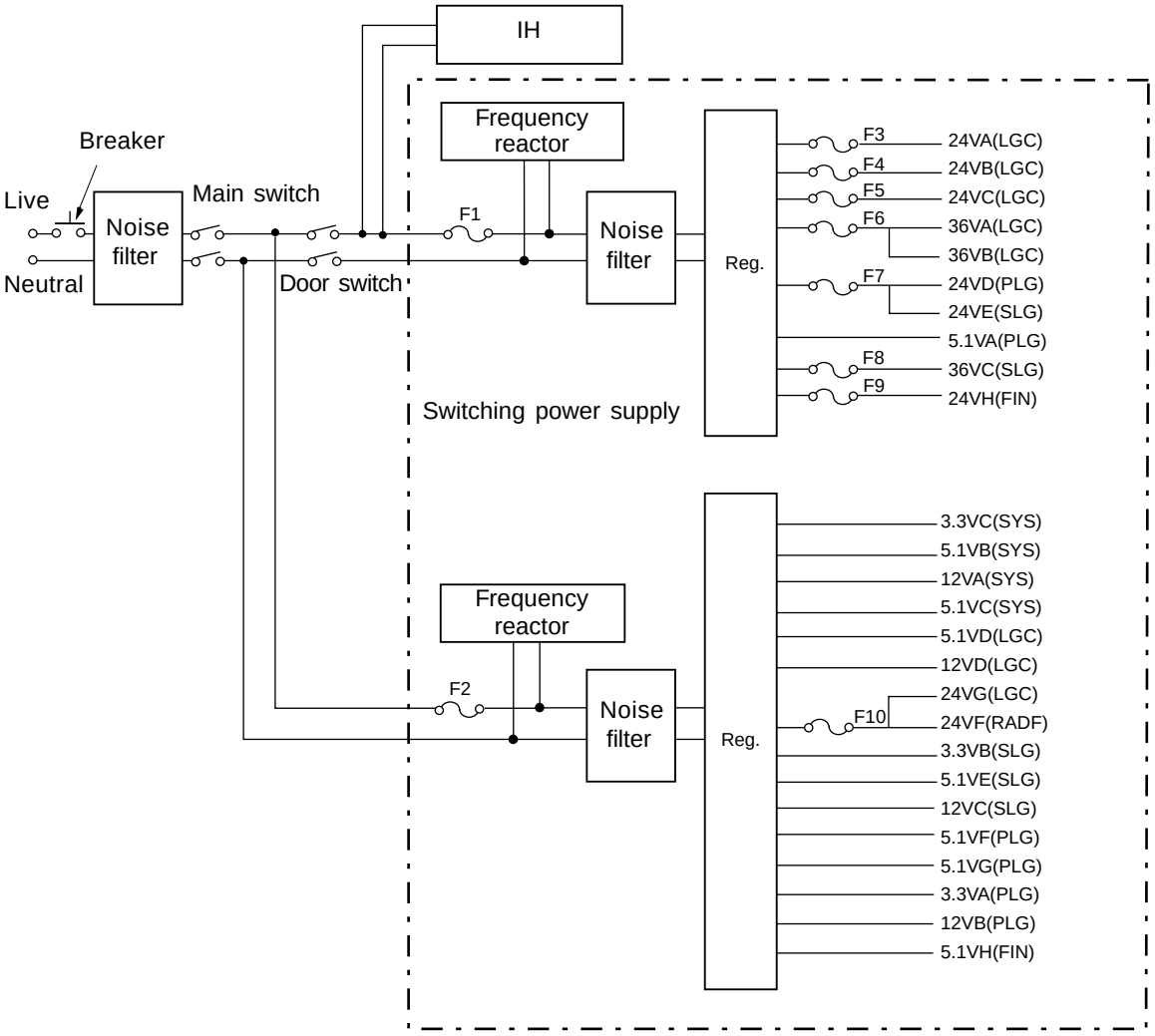
17. 4. Fuse

When the power supply secondary fuse is blown out, confirm that there is no abnormality with each part using the following table.

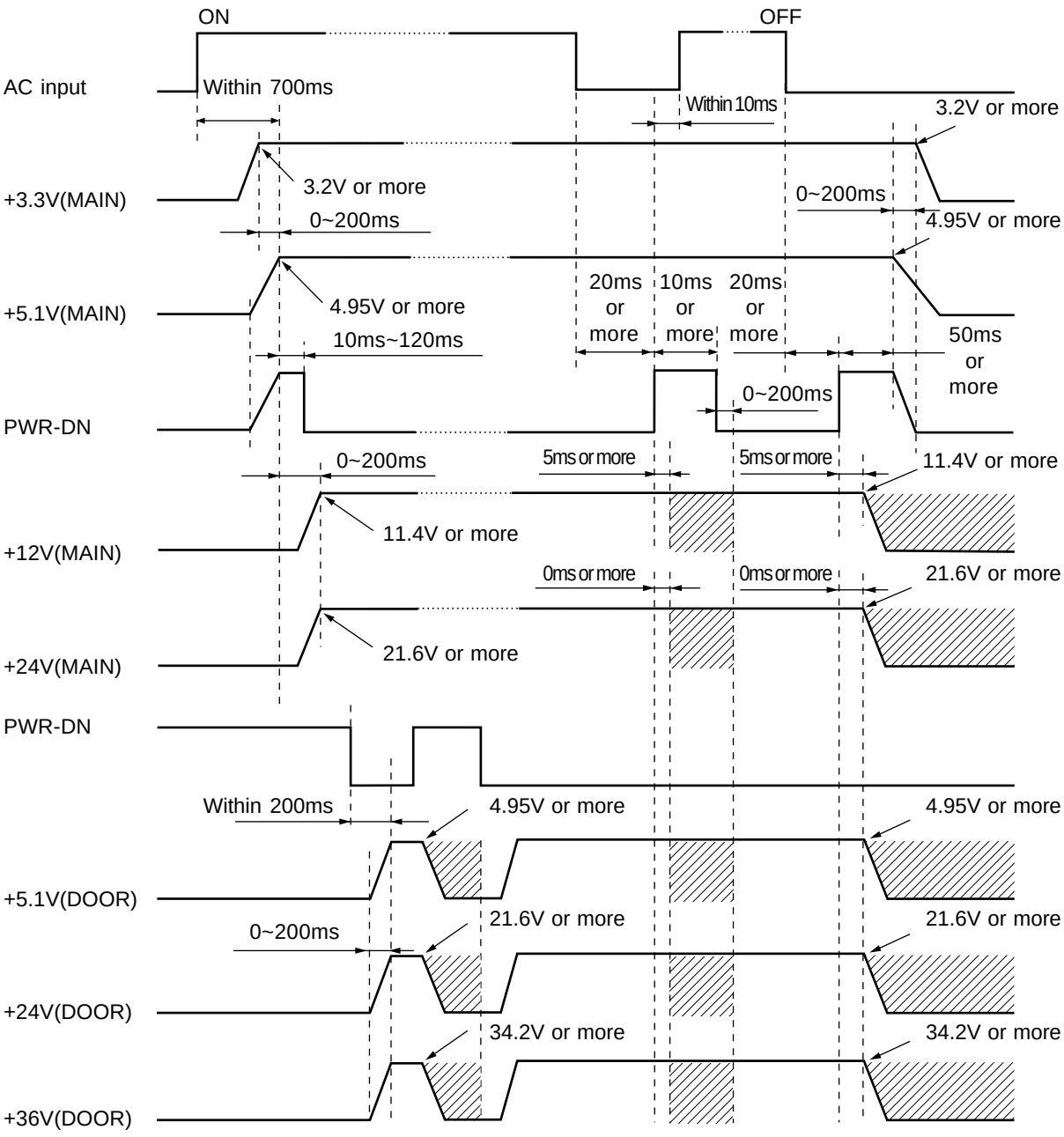
Voltage	Board/Unit	Part	Fuse type
24VA	LGC	System fan motor	F3: 4A (Semi time-lag)
		Duct in fan motor	
		Laser unit fan motor	
		Developer unit fan motor	
		Developer unit motor	
		Drum separation finger solenoid	
		Total counter	
		Key copy counter	
		Stack solenoid	
		Heater fan motor	
24VB	LGC	Main switch	F4: 4A (Semi time-lag)
		Auto-toner sensor	
		Drum surface potential sensor	
		Discharge lamp	
		High-voltage developer bias	
		Reverse motor	
		Exit motor	
		Transfer belt cam motor	
		Charger wire cleaner drive motor	
		Used toner transport motor	
		Cleaning brush drive motor	
		New toner supply motor	
		Toner recycle hopper motor	
24VC	LGC	Reversed paper transport section driving clutch 1 /2	F5: 4A (Semi time-lag)
		1st/2nd cassette transport clutch Tandem LCF transport clutch	
		1st/2nd cassette feed clutch Tandem LCF feed clutch	
		Bypass feed clutch	
		Reversed paper transport section driving clutch	
		Intermediate transport clutch	
		Bypass pickup solenoid	
		Tandem LCF pickup solenoid	
		End fence solenoid	
		Duct out fan motor	
		Exit fan motor	
		Reverse section fan motor 1/2	

Voltage	Board/Unit	Part	Fuse type
24VC	LGC	Registration motor	F5: 4A (Semi time-lag)
		LCF unit	
		IH fan motor	
		Cassette tray-up motor 1/2	
		LCF tray-up motor	
36VA	LGC	Fuser unit motor	F6: 4A (Semi time-lag)
		Feed motor	
36VB	LGC	Drum motor	
		Transfer belt motor	
24VD	PLG (OPT)	Polygonal motor	F7: 4A (Semi time-lag)
		Laser unit fan motor	
24VE	SLG (Scanner)	SLG fan motor	
		SLG fan motor driver circuit (SLG board)	
		Lamp inverter	
36VC	SLG (Scanner)	Scanner motor	F8: 4A (Semi time-lag)
		Scanner motor driver circuit (SLG board)	
24VH	Finisher		F9: 8A (Semi time-lag)
24VF	RADF		F10: 5A (Semi time-lag)
24VG	LGC	Monitering system	
		Totalizer	

17. 5. Configuration of Power Supply Unit



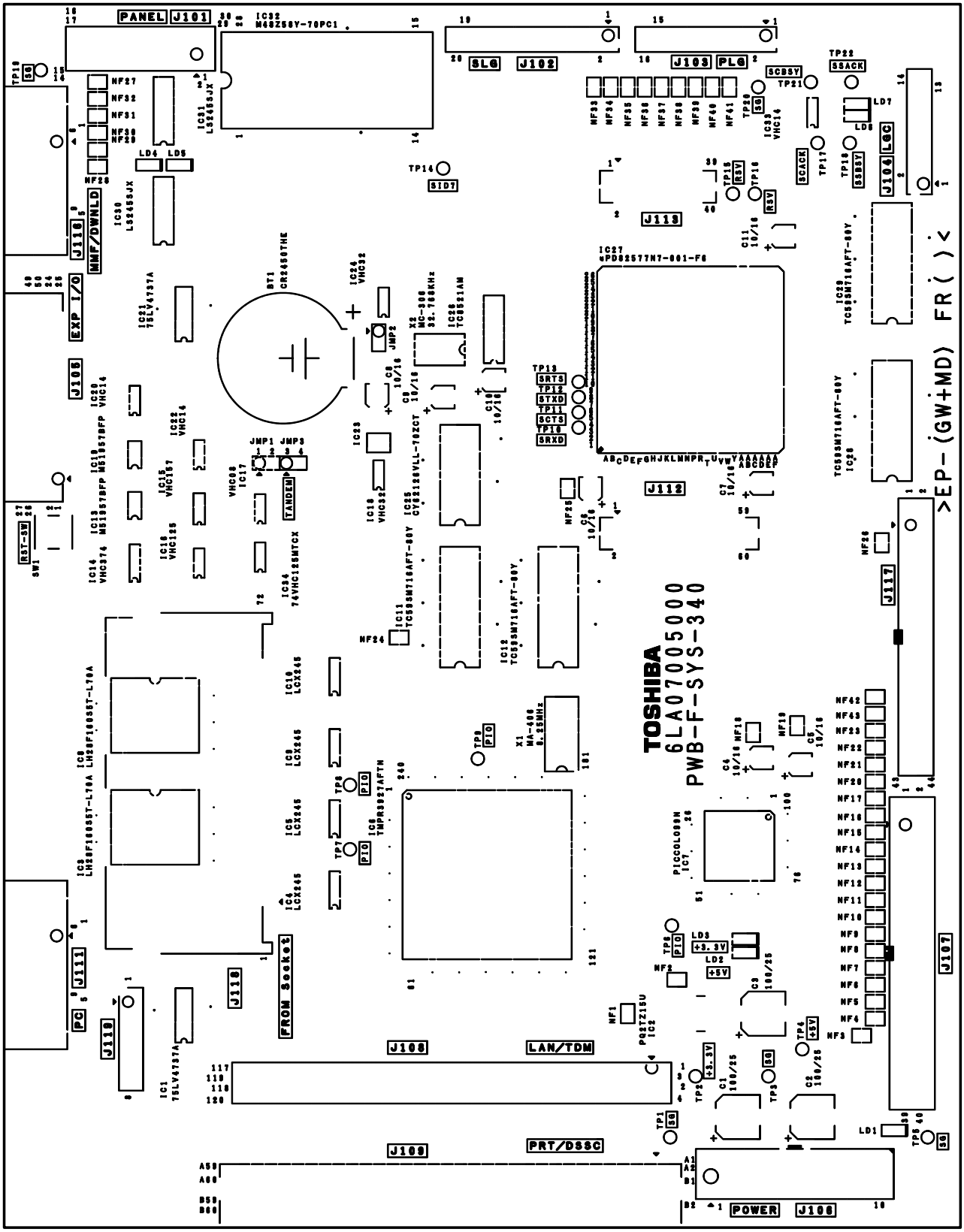
17. 6. Power Supply Sequence



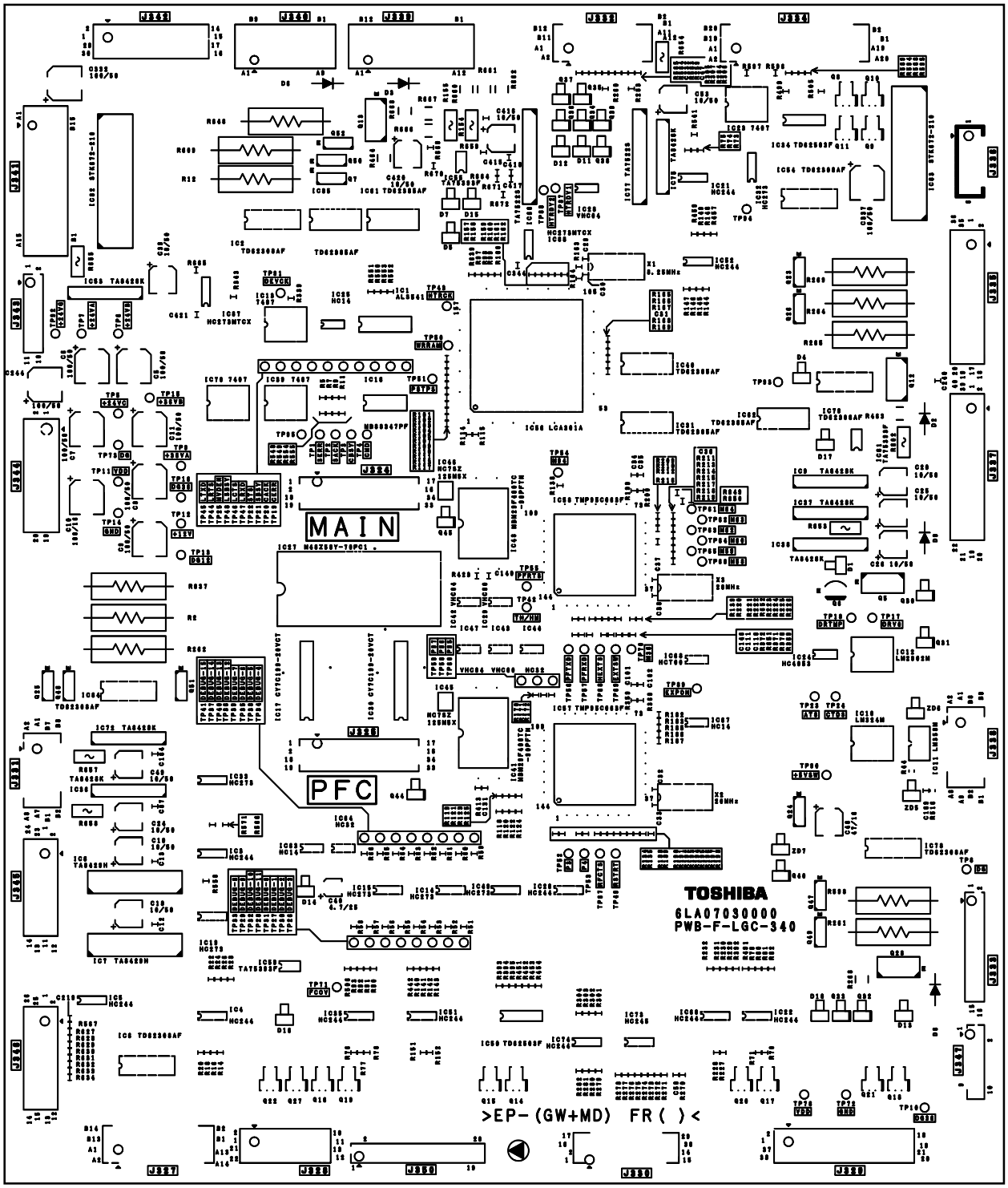
18. PC BOARDS

18. PC BOARDS

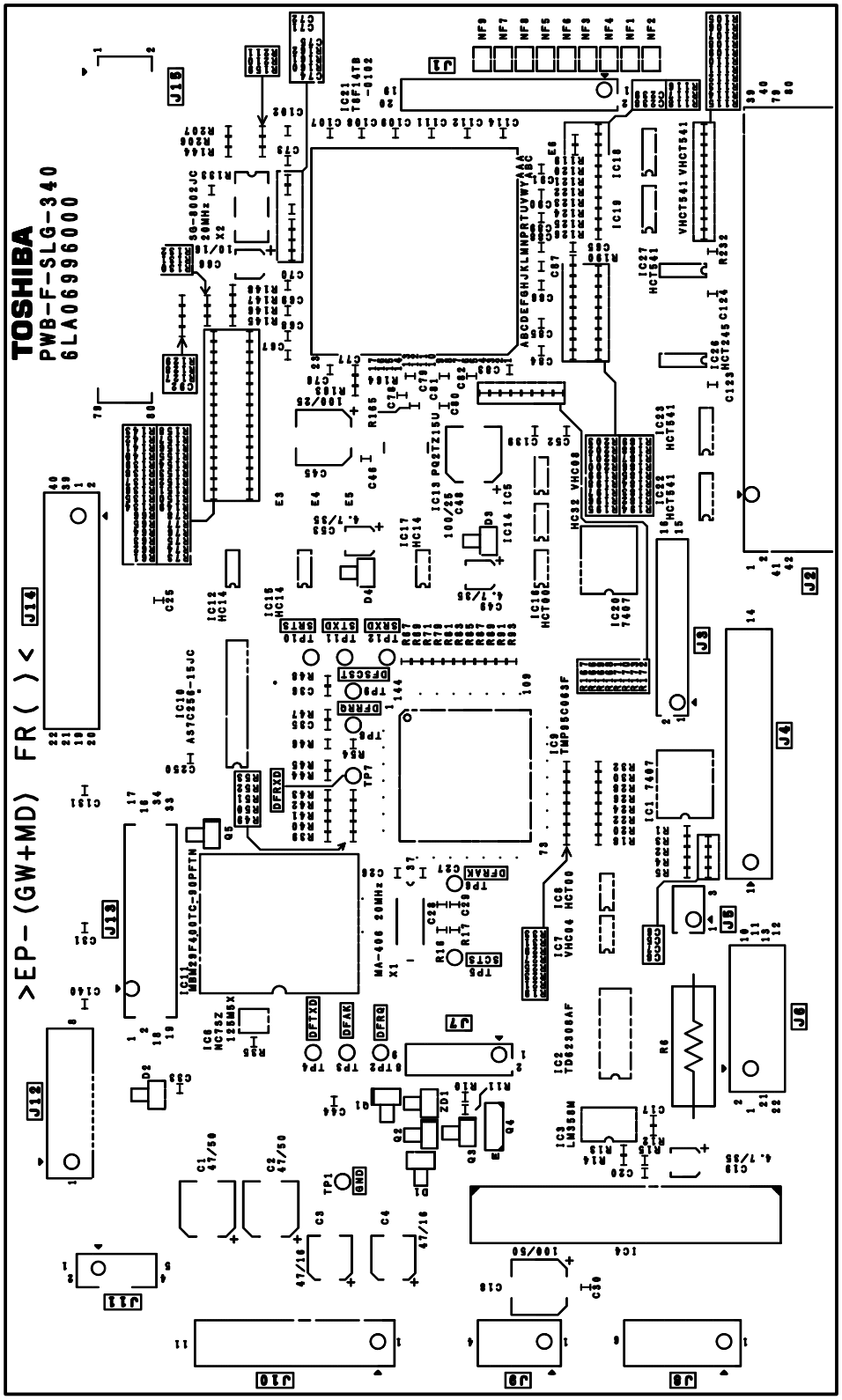
(1) PWA-F-SYS-340



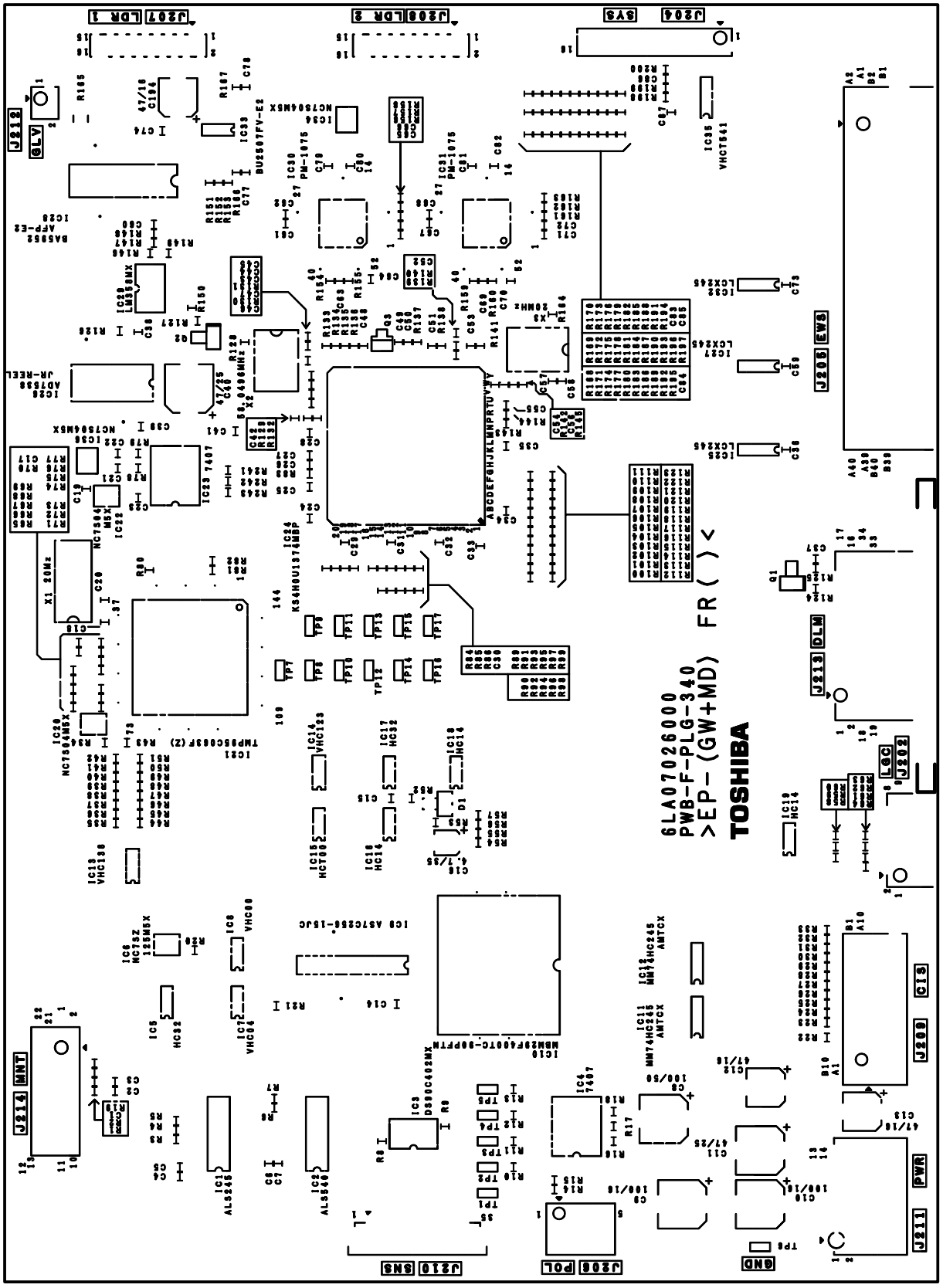
(2) PWA-F-LGC-340



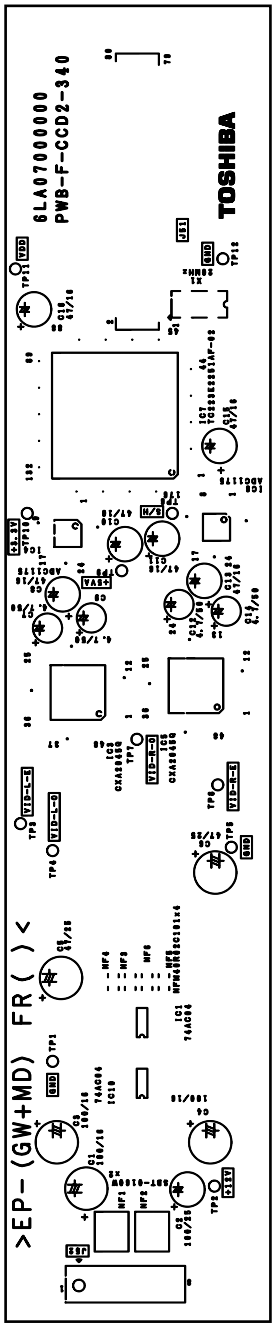
(3) PWA-F-SLG-340



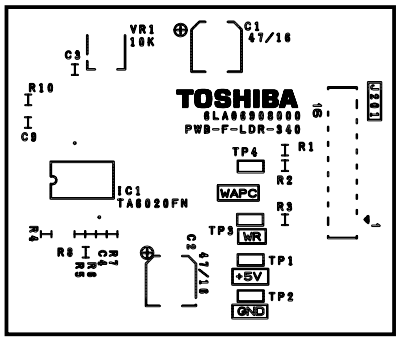
(4) PWA-F-PLG-340



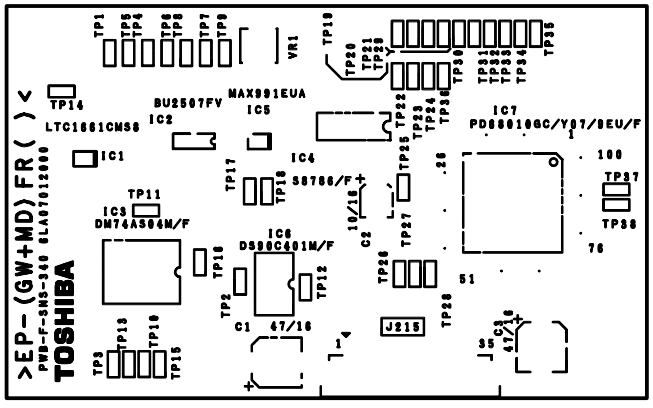
(5) PWA-F-CCD2-340



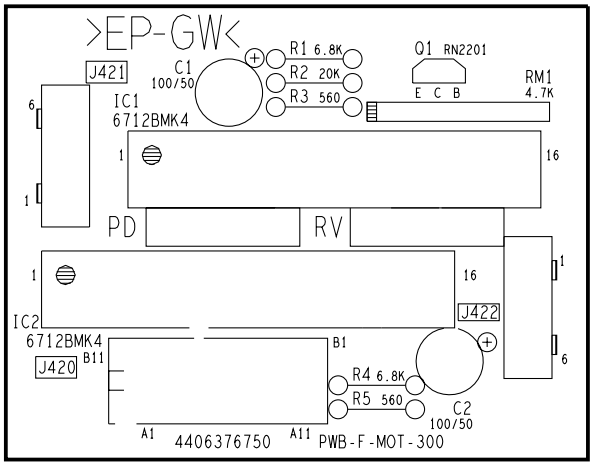
(6) PWA-F-LDR-340



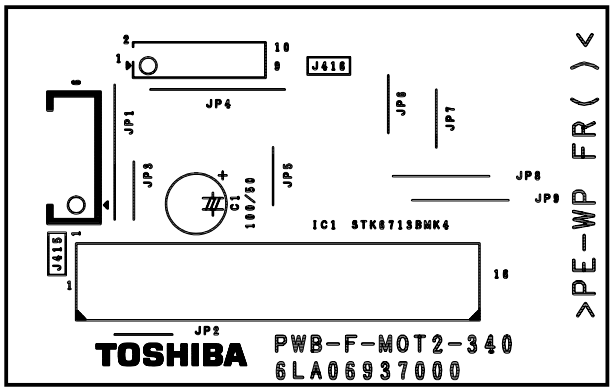
(7) PWA-F-SNS-340



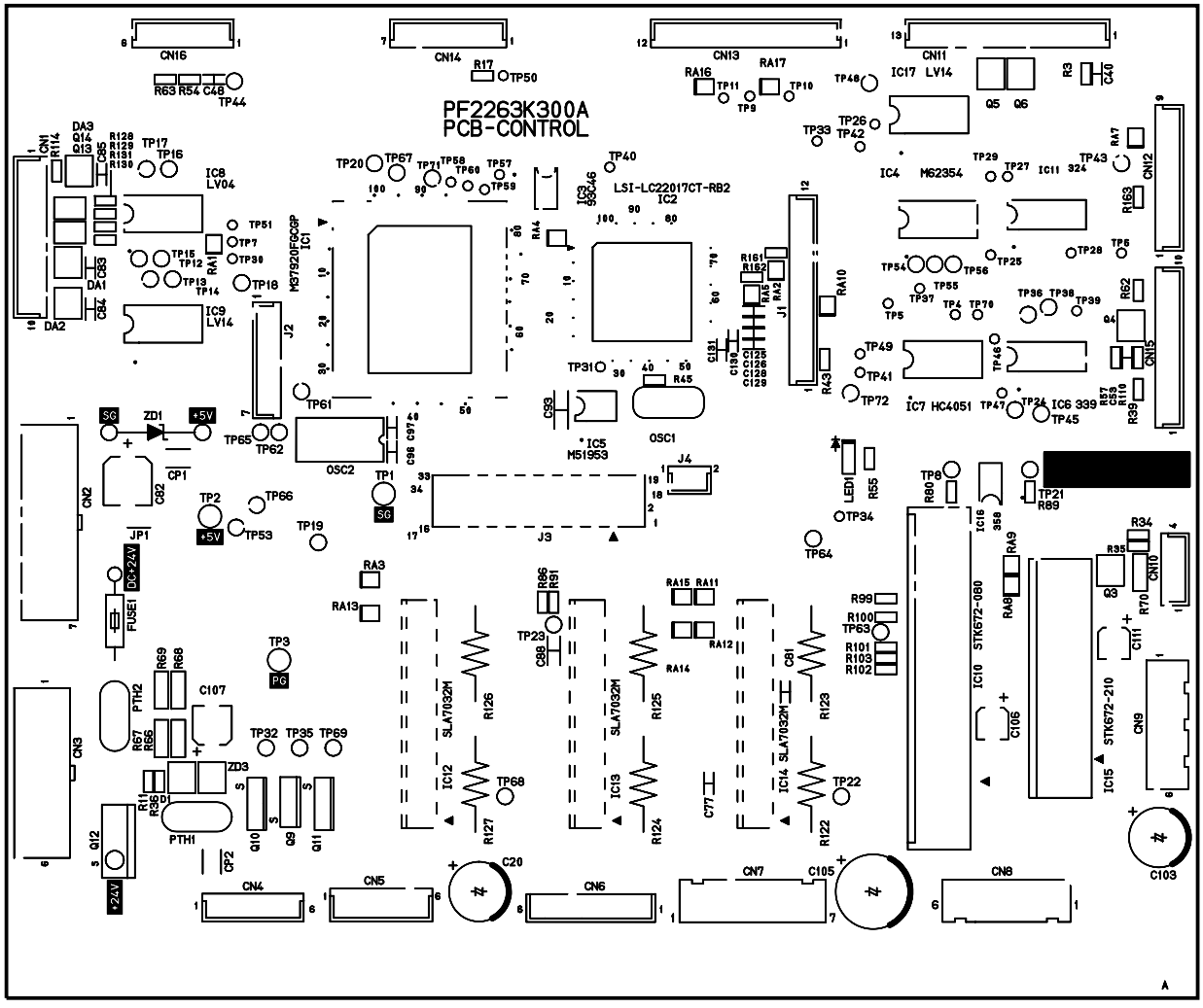
(8) PWA-F-MOT-340



(9) PWA-F-MOT2-340



(10) PBA-CONTROL (ADF CONTROL PC BOARD)



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TOSHIBA

TOSHIBA TEC CORPORATION
1-1, KANDA NISHIKI-CHO, CHIYODA-KU, TOKYO, 101-8442, JAPAN